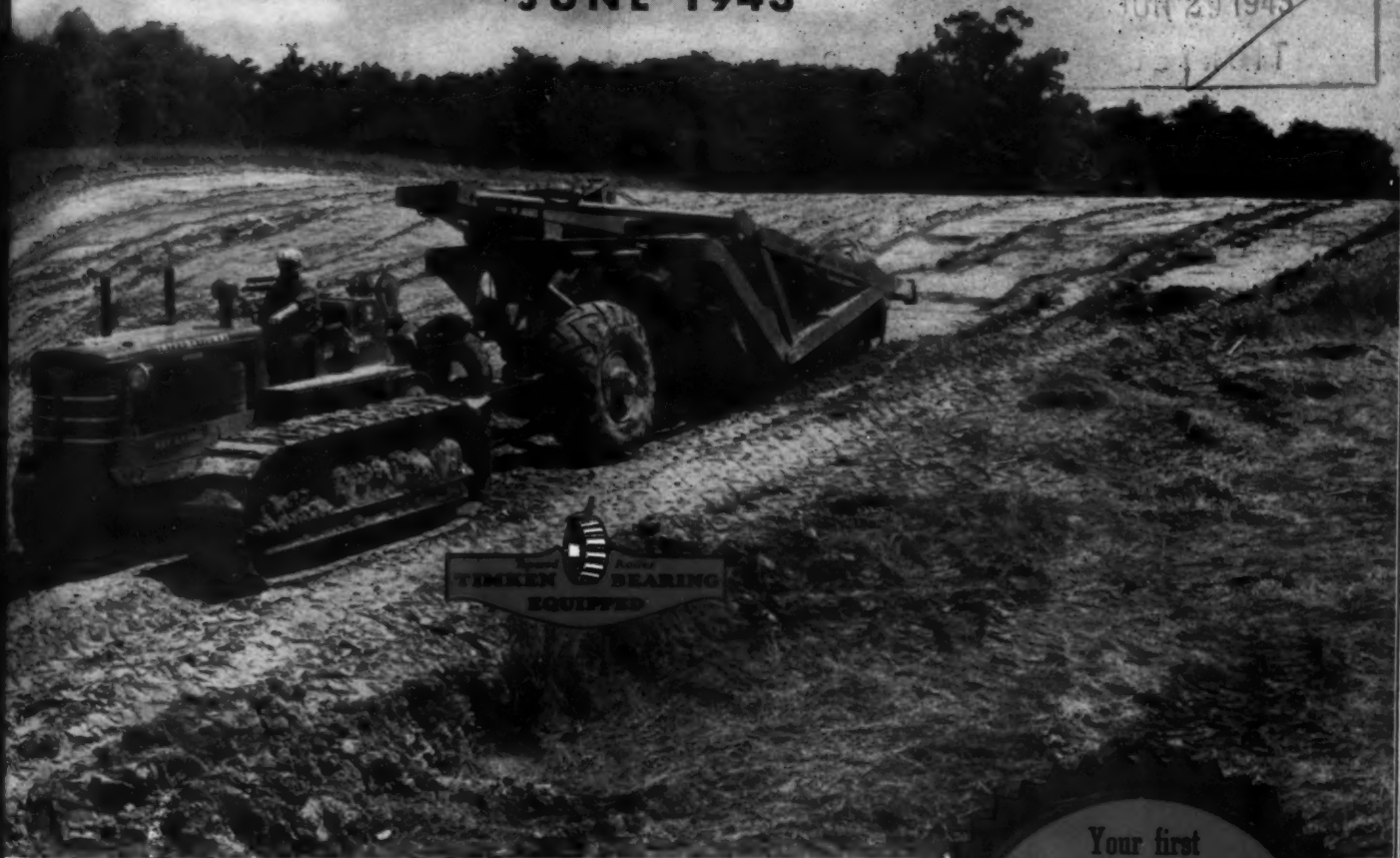


ROADS AND STREETS

JUNE 1943

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Adams No. 100 Hauling Scraper (12½ yd. capacity) equipped with Timken Bearings in all wheels.

Increase the work capacity of your equipment with more Timken Bearings

The use of Timken Tapered Roller Bearings at every suitable position will step up the speed potential of your machines and enable them to stay on the job longer with less attention; that means they will be able to do more work in a given time.

A few Timken Bearings are a lot better than none, but the more there are in any machine the better its performance and the lower the cost for operation and maintenance.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Your first
task is helping to win
the war—but don't wait
to see what will happen
afterwards. Redesign your
equipment now to make
sure of success, come
what may.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

Adams Graders

SAW THE
BEGINNING
OF THE FIGHT

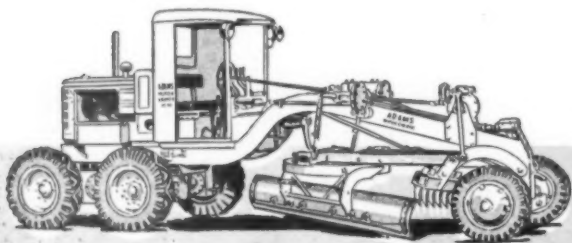
IN AFRICA



The advance of the British army into Abyssinia during 1940-41 marked the start of the allied capture of Africa and, in the words of a South African officer, "Adams Motor Graders operated with the advance troops in preparing roads, camp sites, etc." . . . To attach these machines to General Cunningham's army and to use them in subsequent campaigns, no miracle of overseas transportation was necessary—these graders were already in Africa—a part of the hundreds of Adams machines imported by African author-

ities during the past 20 years to help with the constantly expanding African road building program . . . Valuable in peace, their *availability* made them even more valuable in war!

Throughout the world, in war or peace, Adams machines have filled the bill on the toughest jobs . . . After Victory it will pay you to investigate their possibilities for efficient, economical operation on your peace-time jobs! J. D. ADAMS COMPANY, Indianapolis, Ind.



Adams

ROAD BUILDING • EARTH MOVING EQUIPMENT
Sales and Service Throughout the World

Motor Graders • Leaning Wheel Graders
Elevating Graders • Hauling Scrapers • Etc.

WIRE ROPE FIGHTS AT SEA



TRAPPING U-BOATS

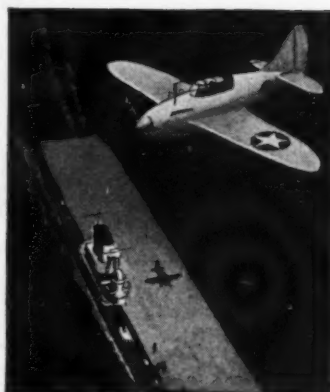
When a Nazi U-boat sneaked into Scapa Flow and blasted Britain's big carrier *Royal Oak* to the bottom, the loss underlined the fact that to block U-boats out of a harbor, you've got to lock it up tight—not just with mines but with elaborate nets made of strand. Keeping harbors closed to undersea marauders is one of Bethlehem's war-time jobs. Our wire-rope mill has been turning out large quantities of harbor-defense strand—a high-strength strand of special construction, and with the famous bethanized electrolytic zinc coating.

TOSSING FIGHTERS INTO ACTION

An aircraft carrier, as everybody knows, houses its fighter planes and bombers on the hangar deck, which is directly beneath the flight deck. When an attack alarm comes in, those planes must get from hangar deck to flight deck and into the air in almost less time than it takes to tell about it. Special Bethlehem wire rope is used in the high-speed plane lifts of some of America's biggest carriers.

TOWING DAMAGED FREIGHTERS

Every cargo vessel in a convoy is now equipped with two husky towing hawsers, installed in such a way that they can be rushed into action at a moment's no-



tice. If a vessel is struck and crippled by a torpedo, one of the emergency towing hawsers is attached to a sister ship and the damaged vessel is brought safely into port. Bethlehem has had a lot of peacetime experience in building strong, corrosion-resistant towing hawsers. United Nations' convoys are benefitting from that experience now.

★ ★ ★

In hundreds of jobs on sea and on land—ships' rigging, aircraft-control cord, mine-sweeping cable, mine-anchor cable, and naval dredge rope, to name a few—Bethlehem Wire Rope is helping to win the war. There are also pressing needs for Bethlehem Wire Rope on the home front—in war factories, mines, timber lands, construction jobs, and oil fields. We are doing our level best to keep everybody adequately supplied. The job is enormous. If you have to wait to get delivery on your rope, we hope you'll keep that in mind, and bear with us.



Bethlehem Manufactures Wire Rope for all Purposes

ROADS AND STREETS

Vol. 86, No. 6

June, 1943



A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; and to the construction and maintenance of airports.

WITH ROADS AND STREETS HAVE BEEN COMBINED GOOD
ROADS MAGAZINE AND ENGINEERING & CONTRACTING

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ROADS AND STREETS
JUNE 1943

Increase the work capacity of your equipment with more Timken Bearings

The use of Timken tapered roller bearings in every machine position will give you the most powerful of your equipment and enable them to stay up the job longer with less downtime. The more they work the more they pay for you.

Is your "Timken" bearing up to the task? Check it out. For more ideas on its application, the bearing's performance and the latest developments in bearing design.

THE TIMKEN BEARING COMPANY, CLEVELAND, OHIO

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TREAD PINHOLES...

THEW-
LORAIN

Emergency
FIX-IT
Handbook



24

PAGES of How to Keep 'Em On-the-Job IDEAS

HERE'S a brand new handbook for all Lorain owners and operators, full of practical ideas on how to make quick, emergency repairs that will keep your machine going. It will tell you how to temporarily substitute for critical, hard-to-get parts and materials—*how to do more with what you've got.*

Many of the suggestions are temporary expedients only, but they will keep your machine on the job—they will help to salvage and conserve worn parts, and will save you time and money, too. Write for your free copy of the Fix-It Handbook now or clip and mail the pledge form below if you want both the Handbook and a Conservation Emblem.

HOW TO GET THIS CONSERVATION EMBLEM

If you want to show others that you are helping to make your equipment last longer, sign and mail the pledge form below. Regardless of the type or make of your equipment, we will send you a colorful red, white and blue emblem (actual size 5" diameter).



THE THEW SHOVEL COMPANY, Lorain, Ohio

I hereby pledge that I shall do all in my power to prolong the life of any construction equipment in my ownership or care regardless of type or make.

I realize that it is my responsibility to avoid time-consuming delays caused by mechanical breakdowns and will see that frequent inspections are made and that necessary adjustments and repairs are promptly taken care of.

I will avoid waste of parts and materials and will eliminate any abuse of my equipment due to non-recommended operation.

Signed _____

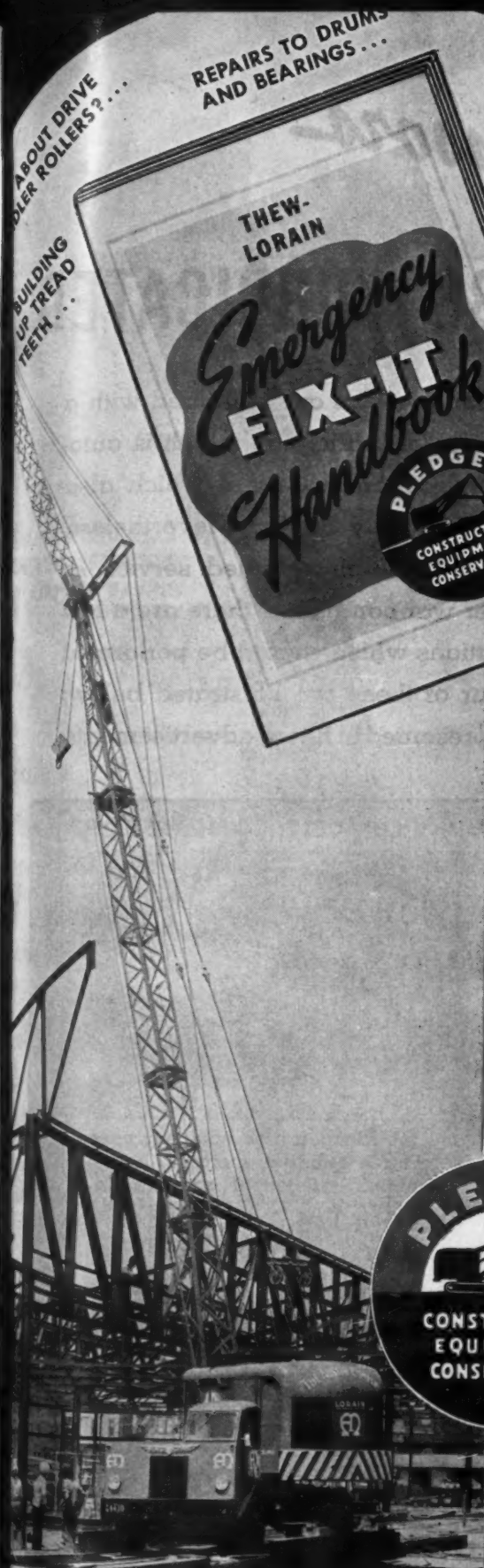
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FIX-IT Handbook Wanted..... Lorain Model No..... Serial No.....

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AGLINES • MOTO-CRANES



Even CP Compressors

MUST BE LUBRICATED



CP Portable Compressors are equipped with a force feed system of lubrication which is automatic, positive, economical — and which also keeps the air relatively oil-free. Nevertheless, for the dependable, uninterrupted service so essential under war conditions, there are a few manual operations which should be performed regularly. Four of these are illustrated below; others will be presented in future advertisements.

HOW TO GET MAXIMUM SERVICE FROM YOUR CP PORTABLE COMPRESSORS



- 1** Remove air intake filter, clean with kerosene weekly. Dry all parts before replacing. Fill oil to head indicated on outer casing.



- 2** Lubricate the fan bearings with a grease gun every three hundred operating hours. Use a semi-fluid grease of good grade.



- 3** Keep crank case filled to indicated level. Drain every 100 operating hours. Refill with grade of oil specified in instruction book.



- 4** Get the habit of checking compressor and engine oil pressure gauges frequently on each shift. Pressure should be about 25 lbs.

★★★★★★★
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(Nicycle...Universal)
ROCK DRILLS

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TOOL  COMPANY

General Offices: 8 East 44th Street, New York, N. Y.

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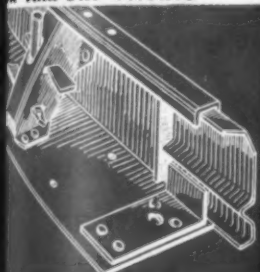
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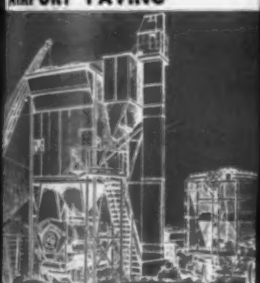
SPREADING MACHINES FOR
CONCRETE AIRPORT PAVING



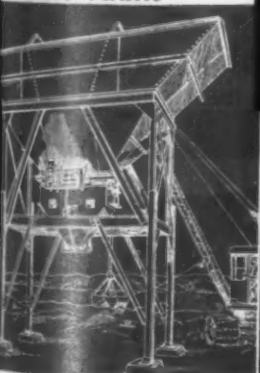
CONCRETE SPREADERS
FOR AIRPORT PAVING



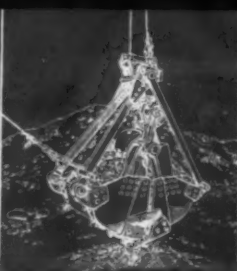
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AIRPORT PAVING



TRUCK MIXER
LOADING PLANTS



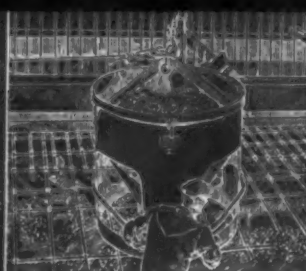
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BATCHING PLANTS



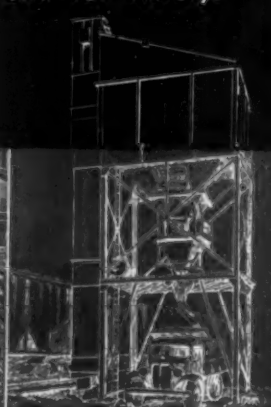
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for dependable Construction Equipment

America's construction forces need reliable and familiar equipment to do the big hurry-up job of building air bases, roads, depots, docks, etc., for the Army and Navy—so, as a matter of course, they took Blaw-Knox Construction Equipment along to the wars.

Our construction battalions throughout the world are guided by men who know from experience the dependability of Blaw-Knox equipment.

Every effort is being made by Blaw-Knox to supply the military requirements for construction machinery—to help build for victory.

BLAW-KNOX

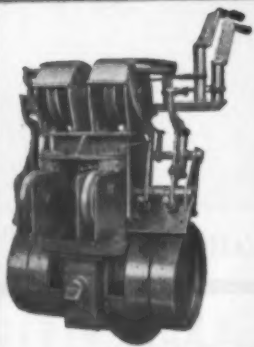
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OF BLAW-KNOX COMPANY**
2003 Farmers Bank Bldg., Pittsburgh, Pa.
NEW YORK • CHICAGO • PHILADELPHIA
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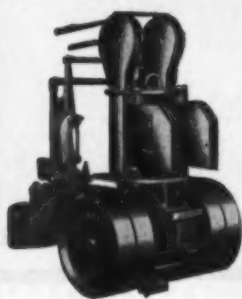
BUCKEYE CABLE control

20 TYPICAL USES

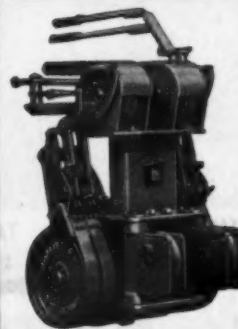
1. Pulling Scrapers
2. Operating Dozer Units
3. Pulling Rippers
4. Operating Pushers
5. Combinations of the above
6. Pile Driver
7. Post Puller
8. Handling Heavy Equipment
9. Culvert Placing
10. Post Setting
11. Removing old Culvert Abutments from right of way
12. Pavement Breaker (with nutcracker)
13. Uprooting Trees
14. Stockpiling Debris
15. Clearing Right of Way
16. Miscellaneous Hoisting
17. Freeing Bogged Down Equipment
18. Handling Skid-Mounted Equipment
19. Operating Double Line Cableway (Drag Scraper)
20. Pulling Cables Through Conduits



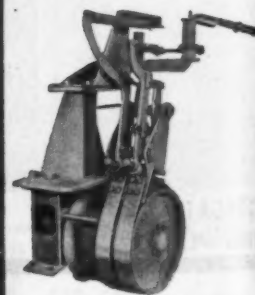
Double Drum
Heavy Duty Hoist



Double Drum
Heavy Duty Hoist



Double Drum
Medium Duty Hoist



Single Drum
Medium Duty Hoist

for... **SPEED**
for... **POWER**
for... **Smooth Action**

FOR operating any cable controlled tractor equipment and for 101 miscellaneous cable jobs as well, Buckeye Power Control Units offer you these big advantages:

FAST ACTION—a touch of the controls and the cable sings into action at a line speed of 300 ft. per min. or more.

PLENTY OF PULL—a line pull of 8500 lbs. is a cinch for a Buckeye winch.

NO JERK ON THE LINE—here's a cable-saving, equipment-saving feature doubly important in wartime. Buckeye Hoists take hold smoothly with a cushioned action.

Buckeye Power Control Units are built for hard usage. Big, cool-running brakes and clutches, cable-saving fair-lead action, high leverage controls within easy reach, gears running in oil, rugged construction—all factors that make Buckeye Winches your logical choice for any make or model of tractor. Write today.

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Findlay • Ohio



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Buckeye Traction
Builder con-
trolled by a
Buckeye Hoist.

Right—Buckeye
Power Control
Units for Bul-
ldozers and
Scrapers in
Panama.



Left—Backfilling
trench in
loose soil with
Buckeye Dozer
and Winch.

Check Page 32.

Built by Buckeye

Convertible Shovels



Trenchers



Tractor Equipment



R-B Finegraders



Road Wideners



Spreaders





When this Scene is Avenged

HUBERS
will be rolling up a
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One of these days airports will be available sufficiently close to Japan so the full might of the Allied air force will be felt where it hurts most. Huber Bulldozers, Rollers and Speed Scoops will be there, too, keeping these airports in condition, regardless of the odds, so the enemy can be blasted off the map . . . and Pearl Harbor truly avenged. It is the one job Huber equipment and the men who build it are looking forward to with genuine pleasure. THE HUBER MFG. CO., Marion, Ohio

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Three new Heltzel Bulletins are ready for you . . . B-19, A-20, C-34, having to do with Steel Forms and Portable Batching Bins.

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PORTLAND CEMENT BATCHING BINS
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Address _____

(Type of construction usually engaged in)



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STEEL FORM & IRON CO.
WARREN, OHIO • U. S. A.

BURYING THE EMPIRE STATE



Two of the Cedarapids Merak Plants producing base material for airports for the Contractors Service Corporation.



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IOWA

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DEFENSE JOBS**

all produced by

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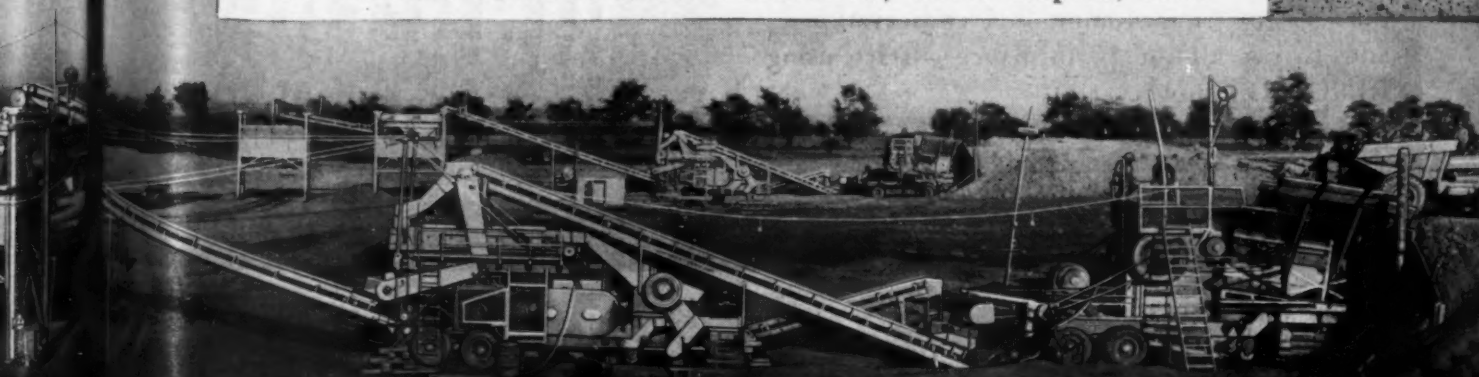
Camp Hill, Pa.

THREE million, two hundred ninety two thousand, two hundred and seventy six tons of aggregate! Think that over! That's the output of the Cedarapids Morok plants of the Contractors Service Corporation of Camp Hill, Pa. Here's enough aggregate to bury the 1250 ft. height of the Empire State Building. All of this tremendous output went into seventeen vital defense projects including such jobs as Chambersburg, Pa., which alone involved over a million tons. The output was accomplished in two seasons despite the sixteen moves that the many projects involved—over a million tons the first season—over two million tons the second season!

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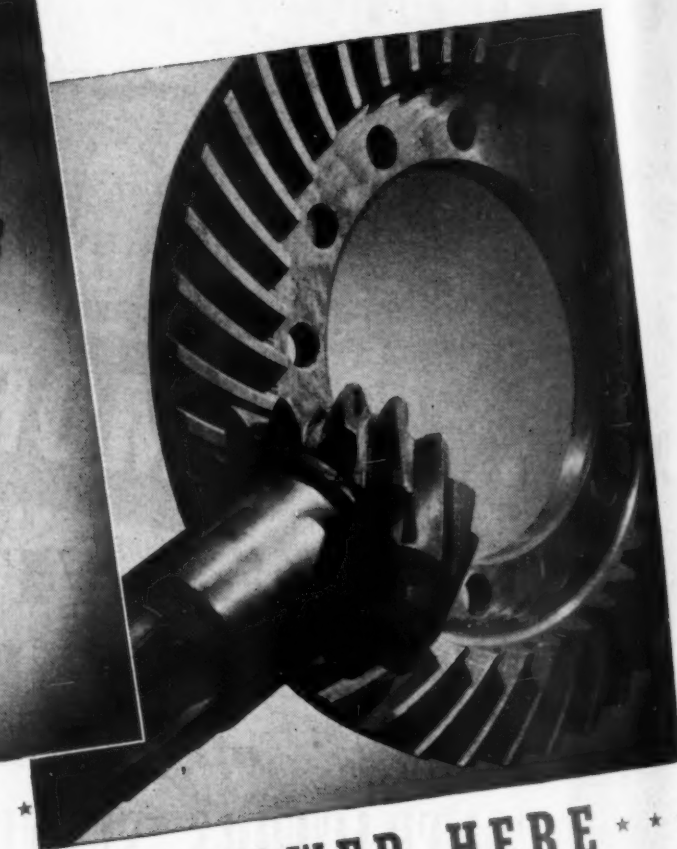
There is a full range of Cedarapids plants for every output or material problem. No matter what you are considering if it has to do with aggregate reduction and preparation, call Iowa first. Come to Headquarters for Aggregate producing equipment.

IOWA MANUFACTURING COMPANY, Cedar Rapids, Iowa





LESS WEAR HERE * * *



MORE POWER HERE * * *

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RING-FREE REMOVES CARBON

This is no time to let carbon and unnecessary wear waste hard-to-replace parts...waste fuel...waste productive horsepower. Lubricate your power plant more efficiently with Macmillan RING-FREE Motor Oil. By reducing friction *fast*, RING-FREE delivers direct to the drive-shaft more of the horsepower ordinarily wasted in overcoming motor friction. And in addition, it actually removes carbon while the engine runs! Carbon removal is a natural RING-FREE function, inherent in the crude oil and retained by the exclusive Macmillan patented refining process. To remove carbon...to minimize "downtime"...to get maximum fuel conservation...and to get all-out performance — start using RING-FREE now!

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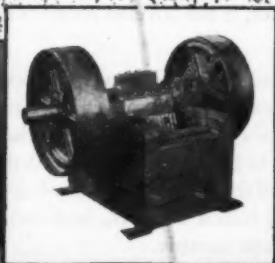
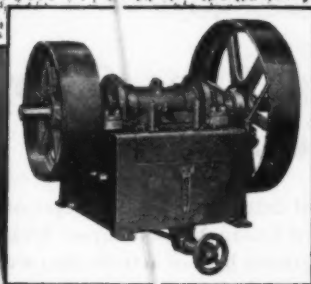
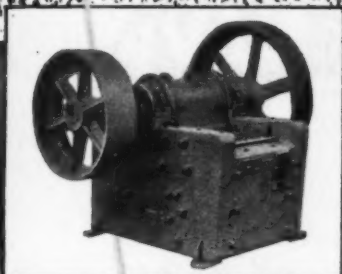
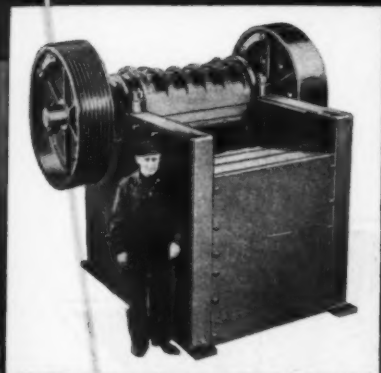
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RING-FREE
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REDUCES WEAR BY REDUCING FRICTION

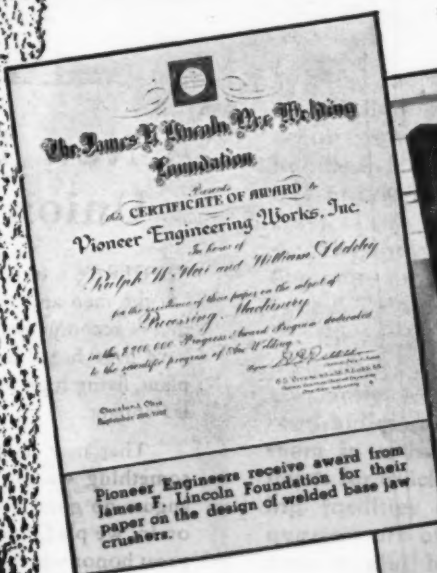
Pioneer now offers---

A COMPLETE NEW LINE



Welded Base JAW CRUSHERS

Pioneer Jaw Crushers have been redesigned and new refinements and improvements have been added. The bases are constructed of steel plates — double walls — reinforced and welded. Larger shafts and bearings and longer jaws have been added in some models. All sizes are overhead eccentric type with manganese steel reversible jaw plates.



PIONEER JAW CRUSHER SIZES: 3042 — 2436 — 2036 —
1536 — 1036 — 1524 — 1024 — 1020 — 1016

All sizes of Pioneer Jaw Crushers are equipped with SKF self-aligning bearings. The 1016 and 1020 are also available with bronze bearings.



Pioneer

ENGINEERING WORKS

MINNEAPOLIS, MINNESOTA, U. S. A.



**ARMY
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NAVY**

**UNION
METAL**

A New Flag Flies Over Union Metal Today

THERE'S a fresh look of determination in the eyes of the men and women of Union Metal today—a look that is accompanied by a greater hum of activity than we have ever heard around here before. For, outside our plant, flying high for all to see, is the coveted Army-Navy E Pennant.

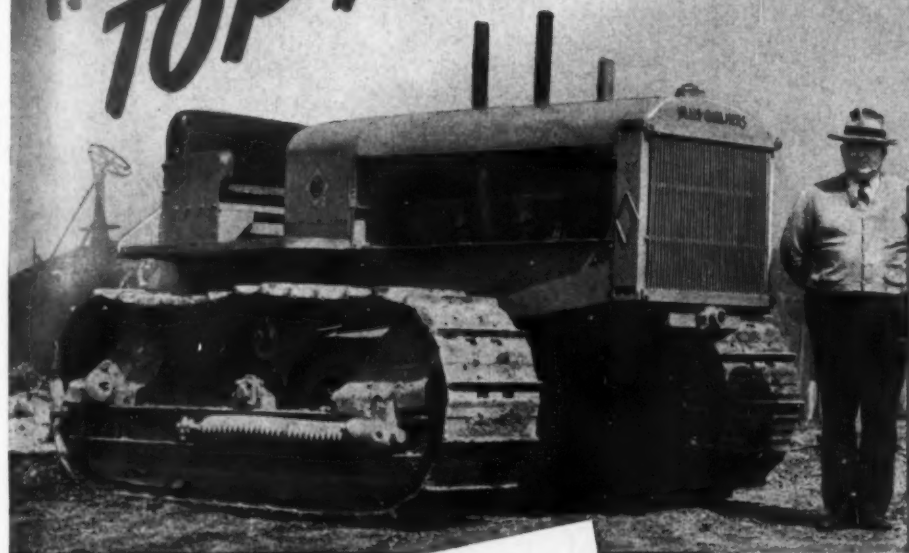
That new flag has done something to all of us—something we can't quite explain, but which certainly augurs no good for America's enemies. And, from here on in, we pledge to do our best to *continue* to merit this great honor which the armed forces have conferred upon us, and to give to them the fullest support, both moral and material, of which we are capable.

Special War Products—Cargo Booms and Masts, Practice Bombs, Recoil Mechanisms, Gun Mounts.

Regular Products—Steel Street Lighting Standards, Monotube Steel Pile Casings, Steel Skids and Boxes, Monotube Steel Poles for distribution and transmission lines.

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CANTON, OHIO
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"TOP NOTCH SERVICE"



Mr. G. S. Riley of Allied Bituminous Products, Inc., proudly stands beside his rejuvenated, 1936 Model L, now back in shape for many more hours of tough service. Repairs on this outfit included re-ground valves, new master clutch, new steering clutches, new bearings in transmission, new final drive pinion, repairing final drive, replacing seals in 4 rollers and turning pins and bushings. A new motor kit was also installed.

Allied Bituminous Products, Inc.
PRODUCERS - - - CONTRACTORS
REPAIRING PRODUCTS
TANKS, APPARATUS AND STRUCTURES
INDIANAPOLIS, IND. Telephone Mchick 1436
2100 South Harding St.

April 22, 1943

Mr. E. W. MacAllister
MacAllister Tractor Company
808 Daly Street
Indianapolis, Indiana

Dear Mac:

This is just a little note of appreciation for the fine service you gave us on the Model L. As you know, that old 1936 outfit served us long and well and we figured it was about shot. When you told us what it would cost to rebuild it we were really surprised--and frankly we didn't believe you could do it for the figure nor as fast as you did.

We certainly are glad to have the "L" back on the job ahead of schedule and billed to us right at your estimated figure. That's what I call top-notch service. We have a considerable amount of work ahead and know that our Model L is now in shape to do its share.

Yours very truly,

ALLIED BITUMINOUS PRODUCTS INC.

G. S. Riley
Vice President

HANDLING

repair or rebuild work the way it should be handled... getting the job finished on time... and at lowest possible cost... that's Top Notch Service! It's the kind an Allis-Chalmers dealer recently gave to Allied Bituminous Products Company on a tractor overhaul job... the kind your A-C dealer is equipped to give to you.

His factory-trained mechanics are skilled in their work... have specially adapted tools for efficiently tearing down tractors and other road-building equipment and for reassembling them in a hurry. His shop is equipped with hoists for quickly lifting heavy sections. Machining facilities are readily available. Working quarters are of the best--ample and clean--assure careful handling of delicate Diesel parts. Replacements are genuine Allis-Chalmers parts. Welding worn or broken sections, cleaning and painting are all a part of his service.

His experienced judgment in sizing up a job enables you to know beforehand about what has to be done and what it will cost. Why not have your Allis-Chalmers dealer check YOUR equipment NOW... it will pay you many times over! Take care of your machinery and it will take care of you.

ALLIS-CHALMERS

TRACTOR DIVISION — MILWAUKEE, WIS., U.S.A.

ROADS AND STREETS, June, 1943

DOMINICAN REPUBLIC • NEW ZEALAND • CANADA • BRAZIL • NICARAGUA • CHINA • SOVIET UNION • HONDURA
• AUSTRALIA • PANAMA • UNITED KINGDOM • MEXICO • INDIA • SOUTH AFRICA • GUATEMALA • CUBA • COSTA

Serving EVERY Nation of the UNITED NATIONS



The End of Shooting War

IN EVERY MIND is the thought of Victory, but the word is only a symbol. Victory will mark the end of killing, and destruction—but it has no substance. Victory we must have, but having it will give us little—until we win the PEACE.

Production—construction—REconstruction . . . these will be on call when war is done, and these have been International Harvester's fields, without frill or ornament, for 112 years.

Today Harvester builds weapons for every theater of war. It builds many that are deadly, many that will be useless after Victory. But Harvester also builds many machines whose job in modern war is very like the work of peace. Take these powerful crawler tractors, for example. Tens of thousands of war-gearred Internationals serve in all branches of the Armed Services . . . as prime movers of big guns . . .

smoothers of bomb-torn landing-fields . . . clearers of jungle . . . builders of mighty emergency highways.

When it's time to carry on beyond a Victory, here's a combat weapon ready-made to fit the peace. War is toughening the tractor, as it toughens the soldier—readying a powerful force to help rebuild the world.

When guns are silent, the roar of the engines of *REconstruction* will be music to the ear. Count on *International Power*, devoted now to war but dedicated to the greater works of PEACE!

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago, Illinois

★ ★ *Buy more War Bonds* ★ ★

MAJOR WAR PRODUCTS BUILT BY INTERNATIONAL HARVESTER

Half-Track Military Vehicles	Torpedoes	Artillery Prime Movers	Automatic Airplane Cannon	Military Trucks
Oerlikon Gun Mounts	Military Tractors	Steel Products for Military Use	Shells	Trackers
Gun Carriages	High Speed 155 mm. Gun Carriages	Marine Corps Invasion Ice Chests	Blood Bank Refrigerators	
Tank Transmissions	Gun Loaders	Airplane Engine Cowling Assemblies		

INTERNATIONAL POWER

ROADS AND STREETS, June, 1943

SPEEDING UP U. S. NAVY AIRPORT CONSTRUCTION




HERE one mile equals fifteen. This Normal Duty Barber-Greene Mixer is mixing sand asphalt for runways over 300 feet wide and 6" thick. There's a big job to be done, and the Barber-Greene is doing it with speed, economy, and perfection. Rated at $1\frac{1}{4}$ to $1\frac{3}{4}$ yards per minute in the B-G Catalog, this Normal Duty Model 848 is consistently mixing 3 cubic yards per minute of loose material on this job, not only speeding up construction, but meeting rigid Navy inspection.

Its ability to handle any bituminous or stabilizing job, in either Travel or Central Plant operation, its portability, high capacity, and thoroughly earned reputation for accurate proportioning and thorough mixing deserve your investigation. The B-G Mixer Book explains and illustrates its many outstanding features. Write for your copy. There is no obligation.

40-14

BARBER GREENE
AURORA ILLINOIS





NEVER BEFORE IN ANY WAR—
BARRAGE BALLOONS

nor

these modern "steel muscles"
that hold them in place . . .

Preformed wire rope

Half the battle, in the performance of this great modern defensive weapon, is the part played by Preformed Wire Rope—not only the anchor lines which hold these balloons captive, but the steel tentacles that entangle and destroy invading planes.

Throughout this mechanized war—from the striking weapons of offense, to behind-the-line production and transportation of those weapons, there is hardly a task in which Preformed Wire Rope is not at work demonstrating its greater strength, greater stamina, longer life, man-hour saving and cost reduction—developed on peacetime industry's proving ground.

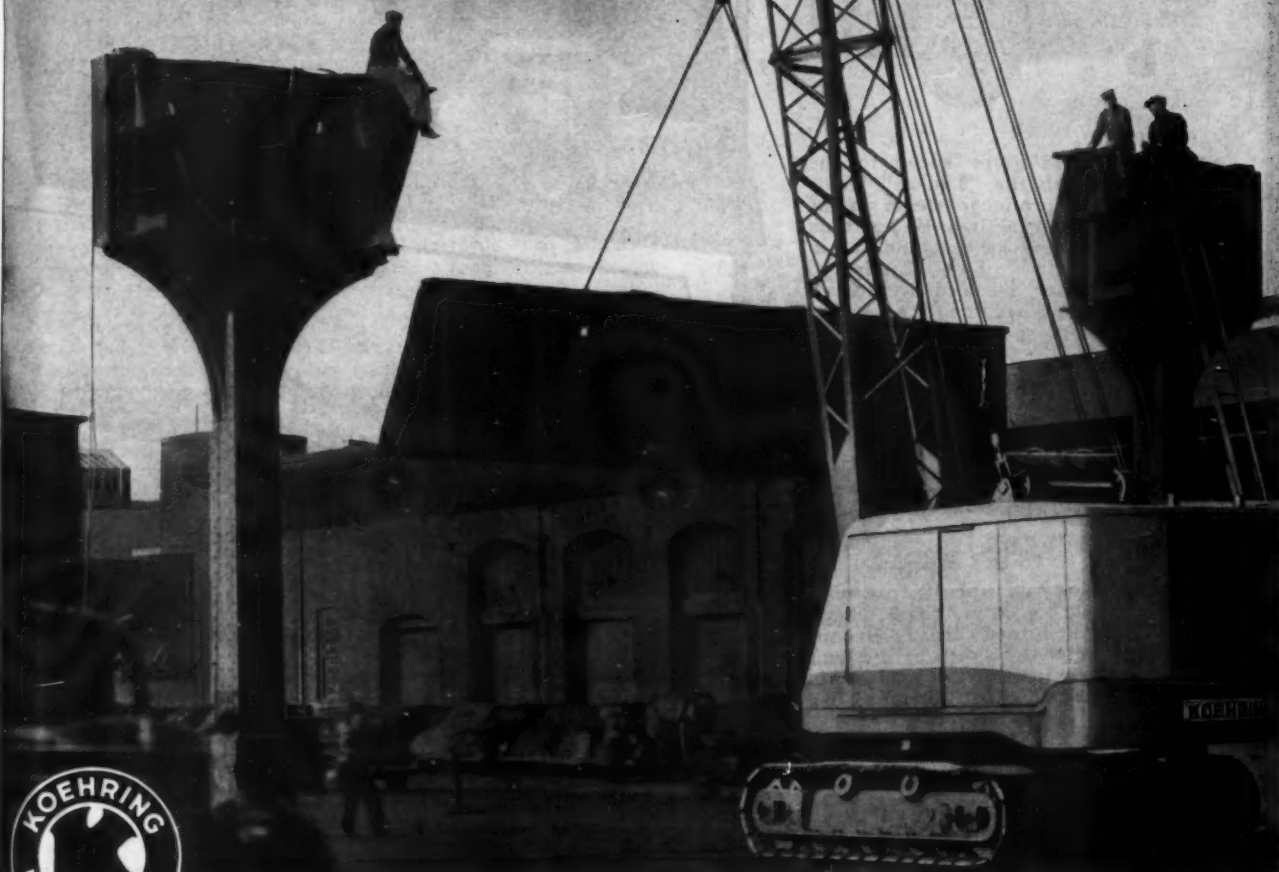
Ask your own wire rope manufacturer or supplier

Move Your Scrap **TODAY**

Your Scrap is Needed...Now!

More scrap...more scrap...is the Victory cry of the mighty steel mills. Miles of useless steel tracks, and obsolete metal structures, too, are potential war material. Koehring Cranes are helping gather scrap, raze structures, load and handle scrap in the scrap yards. The hungry steel mills will soon transform your scrap into much needed steel. Have you a scrap pile...are you collecting scrap every day...every piece of scrap, large or small, is necessary. Help all you can...today...get your scrap moving into the scrap...now.

KOEHRING CO • Milwaukee, Wis.

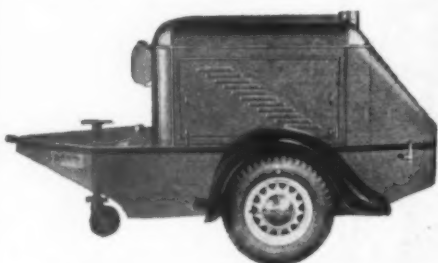


HEAVY-DUTY CONSTRUCTION EQUIPMENT

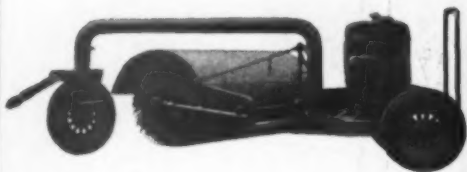
HERE ARE THE LITTLEFORD UNITS HELPING TO PAVE THE ROAD TO VICTORY



"Spray Master" Pressure Distributors are speeding up the construction of Airport Runways, Cantonment Roads, Highways, Parking Areas, etc. Littleford Distributors are the fastest heating and simplest operating Tar and Asphalt Spraying Units yet designed. To get things done, watch the "Spray Master" pave the way to Victory.

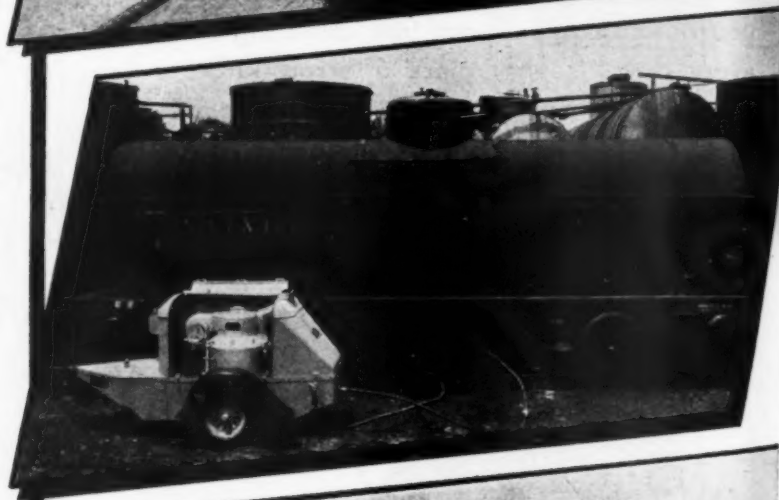


Again Littleford gives speed to the War Effort with the "Tankar" Heater. This unit produces steam faster than any similar unit. Heats tank cars for unloading asphalt and tar in 1/3 less time. The Littleford "Tankar" Heater is used to steam-clean motors, engines, etc. It's another unit designed to speed up Victory.



Before applying tar, asphalt, road oils, etc., to airport runways, roads, highways, the Littleford Road Broom sweeps them clean; no dust or dirt can hinder the application of materials when a Littleford Road Broom goes into action.

BUY MORE
BONDS AND STAMPS



LITTLEFORD

Littleford Bros., Inc.
454 E. Pearl St., Cincinnati, Ohio

Watch for Ravelling



Stop It Immediately

Ravelling is the result of two things:—

- (1) Filtration of water through the shoulders so softens the base that a break-down occurs.
- (2) Surface treatments have been placed on thin bases and a hard winter produces extensive breaking of the surface.

Before patching operations, the cause should be removed. In the case of filtration of water, reconstruct the shoulder and lower the ditch so that recurrence will be avoided. The foundation should be built up and a patching mixture conforming to the surrounding area should be put on.

In the second case, if the areas which have broken constitute more than 10% of a total road area, it is advisable to try to tear up this surface completely, then reblade and consolidate followed by an entirely new surface treatment.

Where ravelling occurs, the holes should be cleaned out, squared up in the direction of traffic to provide a shoulder against movement and then filled with new aggregate of the same character as the surrounding area. Then, thoroughly consolidate the material.

If the weather has not warmed sufficiently to insure a bond, substitute a medium curing cut-back asphalt in the place of a rapid curing cut-back asphalt. This softer asphalt is pliable for winter work and yet with warm weather, will set sufficiently to maintain stability. For details covering your problem contact The Asphalt Institute, 801 Second Avenue, New York City.

For further information covering complete asphalt maintenance equipment, write us direct so that we can send you the name of our nearest dealer.



REPAIRING RAVELLED SHOULDERS WITH A MODEL 400



REPAIRING BROKEN AREAS WITH A MODEL SJ

Standard Steel Works
NORTH KANSAS CITY, MO., U.S.A.

SALES OFFICES: ST. LOUIS, DALLAS, DES MOINES, PHOENIX, LOS ANGELES, ATLANTA, RALEIGH, SALISBURY, FARGO, CHICAGO, ALBUQUERQUE, COLUMBIA, NASHVILLE, OMAHA, SAN FRANCISCO, SAN ANTONIO, PORTLAND, DENVER, ST. PAUL, OKLAHOMA CITY, NEW YORK, JACKSON, SPRINGFIELD, SALT LAKE CITY, NEW ORLEANS, LITTLE ROCK, EL PASO, KANSAS CITY, CHEYENNE, LOUISVILLE, SEATTLE, SPOKANE, RENO, BOISE, CLEVELAND, LANSING, FORT WAYNE, JACKSONVILLE, MIAMI, SIOUX FALLS, BILLINGS, KNOXVILLE, MEMPHIS.

*Send for
Your Copy Today!*

MOVE MORE MATERIAL WITH
The **DRAGLINER**

BULLETIN "D"

**SPEEDIER DIGGING
FASTER FILLING
QUICKER UNLOADING**



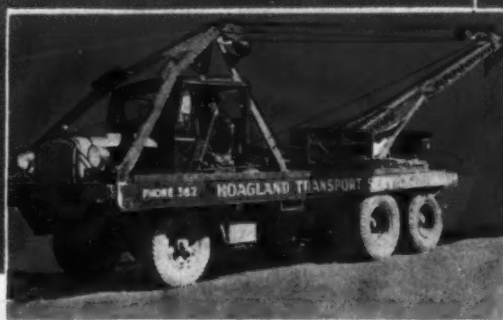
DANIELS-MURTAUGH CO.
631 C AVE. WEST, CEDAR RAPIDS, IOWA

EVERY DRAGLINE OPERATOR SHOULD HAVE THIS BULLETIN. It illustrates in detail how the DRAGLINER is (1) Scientifically designed for great strength and durability. (2) The round smooth front end cuts digging resistance. (3) The Manganese Steel combination hitch plates and bumpers to take the shock and protect the arch and drag hitches. THE DRAGLINER CANNOT BE DROPPED ON THE ARCH. (4) Trouble free lips and teeth as well as a number of features not found in any other design all of which contribute to increased yardages of hard-to-dig materials.

Designed and Sold by
DANIELS-MURTAUGH CO., Cedar Rapids, Ia.

Built by
UNIVERSAL ENGINEERING CORP.

ANOTHER PERFORMANCE
REPORT THAT PROVES FWD'S
SUPERIOR HAULING POWER



Better-Than-Usual
Motor-Truck Performance
is Essential Today...



Transport Operator Relies On His FWD's For Tough, Heavy Duty Hauling...On and Off the Highway

Ed Hoagland, owner of Hoagland's Transport Service, Modesto, Calif., knows trucks and what to expect of them in performance. Read what he writes about his FWD's:

"During my experience in the transport service I have used many different types of trucks and am pleased to advise that my FWD T40 has been very successful in heavy duty hauling whether on the high speed highways or off the highway operation such as hauling through the desert sands of Nevada.

"My FWD HH 6x6 crane truck equipped with a single and double drum winch and 40-foot boom has been very outstanding due to the four-wheel-drive principle and traction which enables it to get to the toughest locations.

"One of the unusual feats accomplished is the erection of the 22-ton boiler in the 30-foot high tower shown in the above picture.

"A large percentage of our work consists of the most difficult hauling and rigging jobs, and the FWD trucks have more than met our highest expectations."

This verbatim report from the field is another instance of the superior hauling power inherent in the true application of the four-wheel-drive principle.

THE FOUR WHEEL DRIVE AUTO CO.
CLINTONVILLE, WISCONSIN

Canadian Factory: Kitchener, Ontario

The True Four-Wheel-Drive with
Center Differential Asks Less In
Gas—Oil—Tires—Replacements.



COMMERCIAL



CONSTRUCTION



UTILITIES



OIL FIELDS



MILITARY

EVERY FIELD WHERE TRUCK QUALITY IS PUT TO THE TEST



—FWD'S DELIVER



Placing 15 in. of soil cement plant mix with two Adnun Pavers.

-the **ADNUN** and soil cement!

MANY a county highway department is going to have to solve the problem of road salvage in the face of scarcities of material, men and money with soil cement and Adnun Pavers.

Adnun Pavers proved their ability on soil cement several years ago when Heldenfels Brothers of Houston, Texas demonstrated that real savings were possible with Adnuns and Soil Cement on a 34 mile project in Texas.

Your Adnun has features for this work that no other type of machine can offer. "Continuous Course Correction" assures more accurate distribution and depth of material. The power cut-off makes possible definite control of materials from the hopper. With the Adnun Raker Bar, mixing is continuous, and finally, Hydraulic Controls assure easy, smooth operation.

Adnuns lay any type of blacktop pavement as well as stone, slag, or soil cement. Initial compaction is provided by the design of the cutter bar without vibration that brings fats to the surface.

Here is a machine that gives you true leveling without forms and a course that rolls out "smooth as silk."

The future of road building is going to call for a lot of blacktop. Plan to know all about the Adnun. If we can furnish literature or information that will help you, don't hesitate to ask for it.

Built by
the Builders
of
**MULTIFOOTE
CONCRETE
PAVERS**

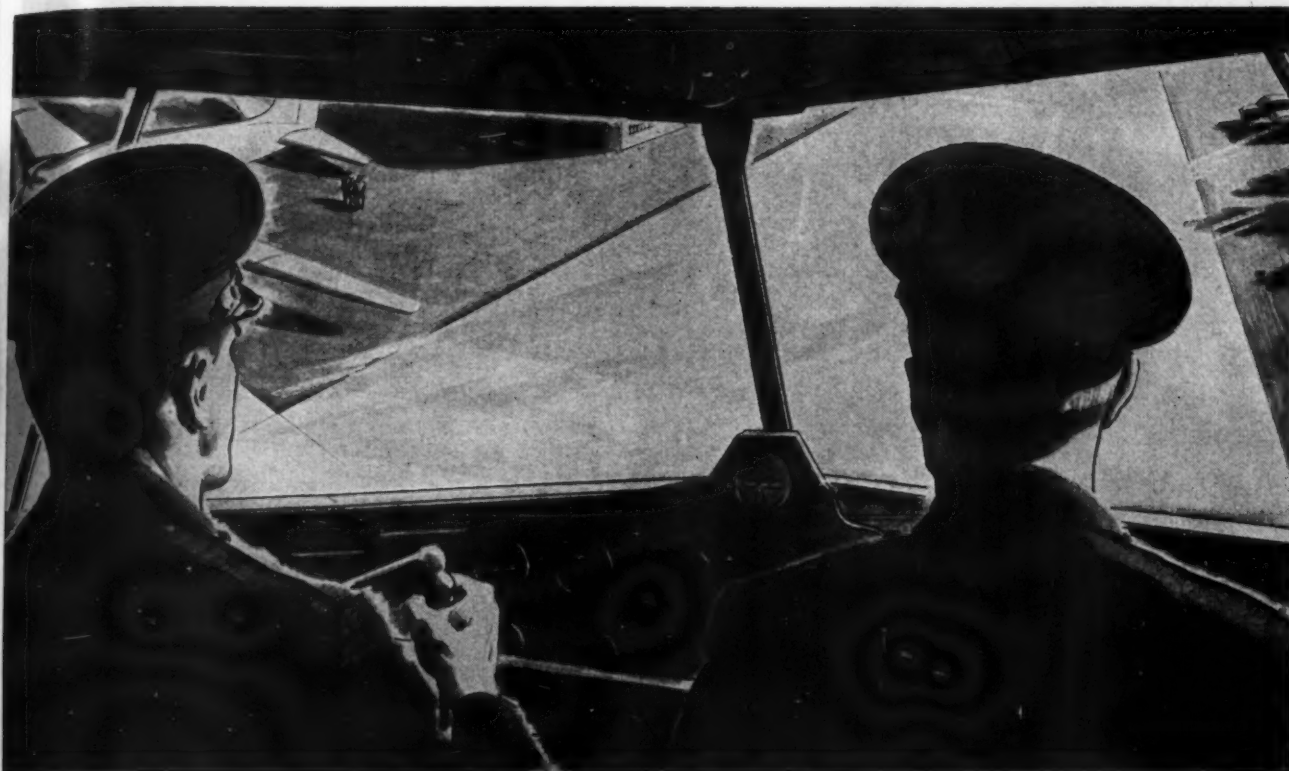
ADNUN
TRADE MARK REGISTERED

BLACK TOP PAVER

THE FOOTE COMPANY, INC.
Nunda • New York
The World's Largest Exclusive Manufacturers of
Concrete and Black Top Pavers

Reg. U.

S



SMOOTH runways for smooth landings

LIKE BUSY HIGHWAYS . . . airport runways and taxiing surfaces have to be kept free of snow and ice throughout long northern winters!

This necessity has created a serious problem for both contractor and operator . . . because constant freezing, thawing, and the action of de-icing agents tend to destroy the surface of concrete, causing it to crack and scale.

Vinsol*-treated Cement Provides Answer!

Experiences of leading cement companies, highway departments, and engineering consultants show that Vinsol-treated cement resists scaling under the most severe weather and de-icing conditions. When Vinsol-treated cement has been laid side by side with normal portland cement, it has shown no tendency to scale,

**VINSOL*-TREATED
CEMENT
RESISTS SCALING**

while the normal portland has scaled right up to the separation joints!

Contractors Enthusiastic!

Furthermore, contractors using Vinsol-treated cement report that it saves time and money in laying. Not only is it easier and quicker to spread but it is faster to finish. Because there is less bleeding and segregation, crews are able to work

closer to the mixer and thus keep up to schedules.

Ask Your Cement Supplier!

Your supplier probably has Vinsol-treated cement with full instructions for its use. We have published a 44-page compilation of articles prepared by engineering authorities. Everyone working with cement should read this booklet, "Better Roads Ahead." Fill out and mail the coupon below for your copy.

*Reg. U.S. Pat. Off.

**Specify Vinsol-treated Cement
for Longer Surface Life**

NAVAL STORES DEPARTMENT
HERCULES POWDER COMPANY
INCORPORATED
972 MARKET ST., WILMINGTON, DELAWARE

Gentlemen:
Please send me a copy of 44-page book, Better Roads Ahead,
telling the complete story of Vinsol treated cement.

Name _____
Company _____ Title _____
Address _____
City _____ State _____

LL-98



Walter Tractor Trucks

TOUGH HAULING JOBS WANTED!

IF YOU'VE got to haul enormous loads through soft dirt, mud, sand, gravel, snow, deep rutted tracks or over broken terrain in all kinds of weather — you need Walter Tractor Trucks! The exclusive 4-Point Positive Drive System, patented Automatic Lock Differentials and Tractor Type Transmission give Walter Tractor Trucks their super-traction and full delivered power for any ground and any weather.

Walter Tractor Trucks have proved their value for years as trouble shooters for 'phone and power companies — hauling 40 to 50 ton loads at iron and coal mines — handling the toughest jobs of road building and maintenance — bucking snow drifts and clearing heavy snows from highways and airports. Wherever and whenever roads and weather are at their worst, you will find Walter Tractor Trucks hauling at their best. Write for detailed literature.

WALTER MOTOR TRUCK CO.
1001-19 Irving Ave., Ridgewood, Queens, L. I., N. Y.

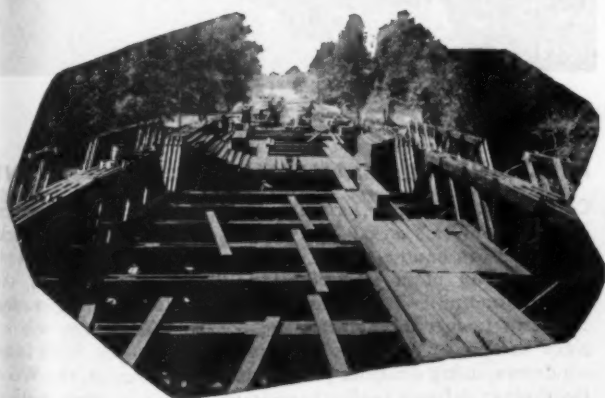
Prefabricated Pressure-Creosoted Wood *bridges the gap at a southern cantonment*



Creation of this southern cantonment demanded immediate construction of several bridges. Materials, manpower and erection equipment were all problems. The answer was suggested by hundreds of highly successful peacetime bridge installations; prefabricated pressure-creosoted wood was used.



This view shows pressure-creosoted permanent piles in foreground, with nose pile at extreme left; they were later latticed with drift fenders. "Falsework" piling is visible in background; it was required in order to position the driver for sinking permanent piles, and to facilitate truss erection.



Two 60-foot truss spans in a vehicular-pedestrian design. Note heavier longitudinal roadway trusses, as compared to walkway trusses. The 3 x 6-inch deck planking is placed on edge when installed. Structural material was pressure-creosoted after framing, to give complete protection.



A completed bridge, with hand rail and 12 x 12-inch wheel guard supported on header boards and riser blocks. Treated wood will save you time and money when used in permanent type construction of bridges, culverts, buildings, wharves or similar projects. Ask for details.

KOPPERS COMPANY • WOOD PRESERVING DIVISION • PITTSBURGH, PA.

KOPPERS

THE INDUSTRY THAT SERVES ALL INDUSTRY

ROAD-MIX CUT TIME ON THIS JOB BY $\frac{1}{3}$



Seal Coating A Wood Roadmixer Job

**Native and local materials
lying at or near the job were used.
Saving equipment and labor**

"Build it good and build it quick." That's how your paving contract reads today; that's why more and more paving jobs are designed for Road-mix. Road-mix methods of pavement construction use native and local materials, which cuts material hauling costs to a minimum. Road-mix uses the mix-in-place or traveling plant method of mixing, which eliminates the central plant and additional hauling. The result is a faster job with less manpower, less equipment and with savings as much as $\frac{1}{3}$ in costs. Road-mix methods of pavement construction, either emulsion, road oils or soil-cement, can be used anywhere paving can be laid. Hundreds of miles of roads, streets and highways, and millions of square yards of landing fields and runways offer highest testimony to the top-quality paving produced by Road-mix methods. Before you design your next job, get all the facts on Road-mix—the modern, money-saving, time-saving method of pavement construction.

➡ ➡ ➡ **DESIGN FOR ROAD-MIX**



Write for detailed and illustrated Wood Roadmixer bulletin, "The Fastest Method of Low-Cost Paving."



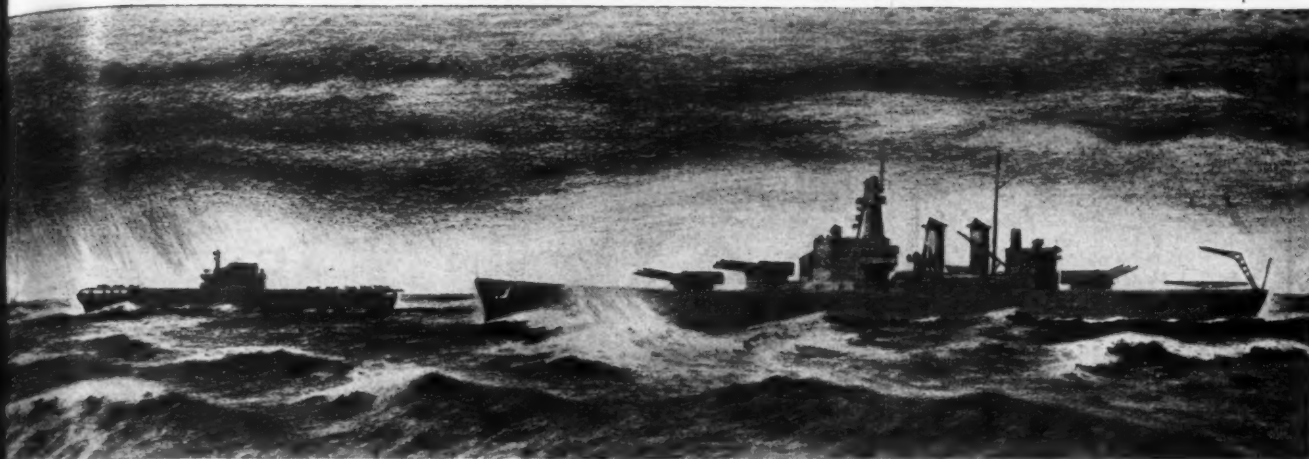
WOOD ROADMIXER

A COMPLETE TRAVELING MIXING PLANT

Compactly designed, ruggedly constructed, easy to operate. Requires only a standard crawler tractor and a supply truck. Two men can handle the entire unit. As the pioneer and leading traveling plant method of pavement construction, the Wood Roadmixer is the lowest in price, lowest in operating cost and lowest in maintenance cost of all proven mix-in-place methods. Working on compacted base or with loose windrows, using emulsion, road oils or soil-cement, the Wood Roadmixer delivers higher production than any other method of pavement construction. Highest quality paving is assured by accurate volume control of aggregate and binder, and carefully regulated mixing action to meet conditions of every job. Easily hauled or towed from job to job. Own a Wood Roadmixer—and you can design, bid and build Road-mix.

WOOD ROADMIXER

Wood Manufacturing Co. • 516 West 5th St., Los Angeles, California



The Navy is a constant user of Galion road machinery . . . must build and maintain land bases for planes . . . build and maintain roads at these bases, often in advanced positions. Galion rollers and graders also on active service with:

AIR FORCE • COAST GUARD • MARINES
ENGINEERS • SEABEES

• • •

THE GALION IRON WORKS & MFG. CO.

MAIN OFFICE AND WORKS: GALION, OHIO



ROADS AND STREETS, June, 1943

© 1943 Great American Industries, Inc., Meriden, Conn.



★ **I'm a Smoke Eater** ★
from 'way back

Many years ago, I drove a Ward LaFrance pumper to many a fire. It never let us down. Neither has the Ward LaFrance equipment we've bought since I became Chief. Today you've got to have an urgent need for fire apparatus to be able to get it—but since we've been buying Ward LaFrance pumpers exclusively for years, we can depend on the ones we have, for the duration and then some. I'm glad to hear Ward LaFrance is turning out big Tank-Recovery Wrecker units and fire trucks for the armed forces. That means our boys are getting the kind of equipment it takes to win a war.

P. S. Ward LaFrance is a name to remember after this war is won. It stands for special

trucks, engineered and built for the job to be done. No matter what your requirements, you'll probably find custom-engineered and built trucks are the economical, efficient, profitable kind of vehicle to buy. It's none too soon to make preliminary inquiries concerning your future requirements. Our experienced engineers will welcome your letter.

WARD LAFRANCE TRUCK DIVISION



ELMIRA, NEW YORK



WARD LAFRANCE

Here's the kind of
PREVENTIVE MAINTENANCE
THAT KEEPS SCRAPERS ROLLING!

Read this **CHECK CHART**

YOUR present 4-Wheel Scrapers will probably have to last you for the duration . . . and they'll have to stand up under the punishment of wartime high-speed 3-shift service. That makes the job of maintenance more important than ever before because even the best equipment requires a regular program of servicing, preventive maintenance and overhaul. Here are a few "pointers" to help keep your scrapers rolling at top efficiency!

YOUR International Tractor Distributor is equipped to do a service job as never before to help you prolong the useful life of your equipment.

1.

Check tires regularly and keep them inflated exactly as recommended by the manufacturer.

2.

Lubricate regularly using good grade lubricants and following the manufacturer's instructions carefully.

3.

Inspection should be regular routine and every effort made to locate and correct troubles before they become serious.

4.

Repairs should be made promptly and with special care so that the original strength and efficiency of the entire unit will be maintained.

5.

Don't let cutting edges wear down too far or lip castings will be weakened.

6.

Keep rub-plates built up and hard-faced to protect lip casting.

7.

Disassemble and clean the sheaves regularly to prolong the life of the bearings, pins and other parts.

8.

Check all cable leads to see that ropes are properly aligned to prevent undue rope wear.

9.

If a sheave-stand is bent, straighten it before the off-lead damages or cuts the cable.

10.

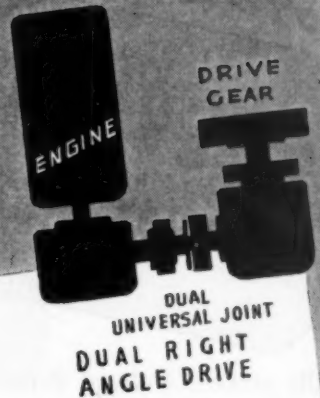
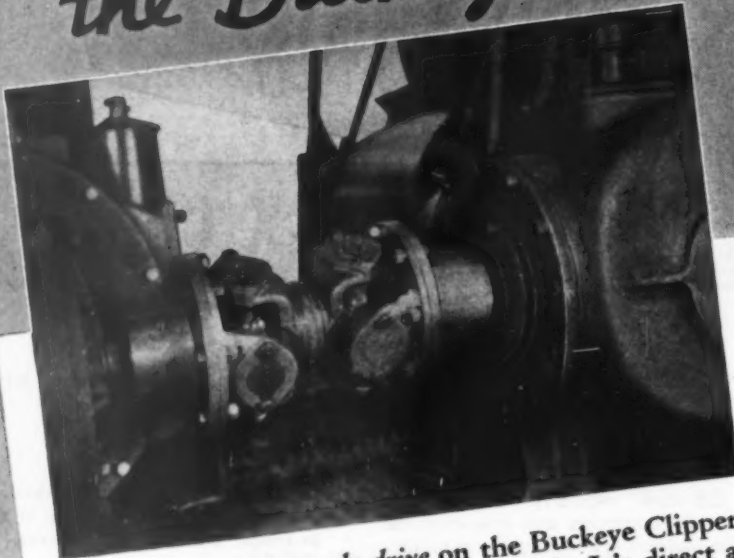
Save cable by avoiding unnecessary stress. Do not travel with ejector, apron or bowl hoisted to extreme height.



**BUCYRUS
 ERIE**
 TRACTOR EQUIPMENT

SEE YOUR
INTERNATIONAL TRACTRACTOR
 DISTRIBUTOR

*This drive helps "Wean"
the Buckeye Clipper Shovel!*



The dual right angle drive on the Buckeye Clipper provides a smoother flow of power from engine to drive shaft. It's direct and positive like the differential of a tank, truck or car. It's easier on the engine. Acceleration is smooth and fast. Result: *More yards daily with less gas or distillate.*

Fuel conservation is urgent today—after the war Clipper owners can pocket the savings that result from lower fuel requirements. Get the rest of the story in "The Age of Clippers," sent on request.



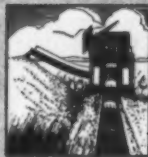
**Buckeye
Traction Ditcher Co.
Findlay, Ohio**

★
Wars demand scrap.
Invest in War Bonds.
No laying down on jobs.



Buckeye✓

CONVERTIBLE SHOVELS, TRENCHERS, BACKFILLERS, TRACTOR
EQUIPMENT, CRANES AND POWER CONTROL UNITS





SAVES MANPOWER

All the way down the line, less manpower is needed when gravel-type roads are maintained with calcium chloride, since hauling and placing of resurfacing materials is eliminated and much less maintenance is required.



CUTS BLADING

Each maintenance blader can serve ten times as many miles when roads are consolidated with calcium chloride. Thus the life of hard-to-get cutting edges is lengthened tremendously and blading equipment is conserved.



CONSERVES ROAD MATERIALS

In preventing loss of road materials through traffic action and dust, calcium chloride maintenance saves up to 300 cubic yards of aggregate per mile annually. This also results in saving of tools, shovels, trucks and tires.

In addition to the cost and labor saving advantages of calcium chloride use, the elimination of dust and compaction of road surfaces serves the war effort by

protecting the health and safety of essential farm and industrial workers. Mail coupon for a 62-page Bulletin, "Surface Consolidation and Maintenance."

CALCIUM CHLORIDE ASSOCIATION, 4145 Penobscot Building, Detroit, Mich.

CALCIUM CHLORIDE
for SURFACE CONSOLIDATION

CALCIUM CHLORIDE ASSOCIATION
4145 Penobscot Building, Detroit, Mich.

Please send new 62-page Bulletin on "Surface Consolidation and Maintenance."

Name

Street

City State

ROADS AND STREETS, June, 1943

MARION'S FIRST INTEREST IS TO WIN THIS WAR.



What the Bill of Rights means to our fighting men is summed up in recent victories in every theatre of war. What it means to Marion is reflected in the continuous stream of Marion machines rolling off the assembly lines... the ever-increasing production schedules... the extra speed, stamina and dependability Marion engineers are building into these machines... the remarkable records of performance wherever they are employed. This is Marion's answer to

those who would destroy our Bill of Rights... Marion's way of helping to win the war as quickly as possible.

THE MARION STEAM SHOVEL CO., Marion, Ohio.

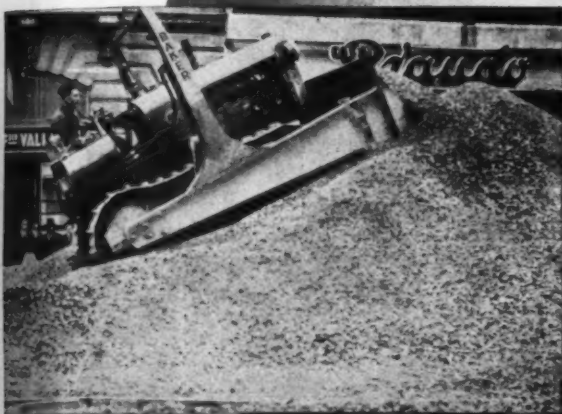


MARION

SHOVELS • DRAGLINES • CLAMSHIPS
CRANES • PORTAL CRANES • WALKERS

WORKING FOR VICTORY: DIGGING—Coal • Magnetite • Iron Ore • Copper Ore • Bauxite • Manganese • Nickel • Molybdenum • Sand and Gravel • Clay. MATERIAL HANDLING—Shipbuilding and Cargo Loading. BUILDING—Airports • Ordnance Plants • Army Camps • Marine Bases, etc.

Ave. Nueve
de Julio
Buenos Aires
Arg.



State Street
Chicago

**Wherever
there's earth to
be moved, Baker Hydraulic
Bulldozers are on the job!**



Chicago gets a new subway and Bakers are put on the job—mucking, ramp grading and spreading material. Buenos Aires, Argentina gets an overpass and Bakers do the earth moving and stock piling with their usual speed. A Baker Graderbuilder gouges a Persian mountain side, turning trail into road, so thousands of tons of Allied supplies can roll into Russia's back door. Dutch Harbor, Alaska gets an unprecedented blizzard and Bakers—that built the air base—are called out to remove snow so patrol planes can land and take off.

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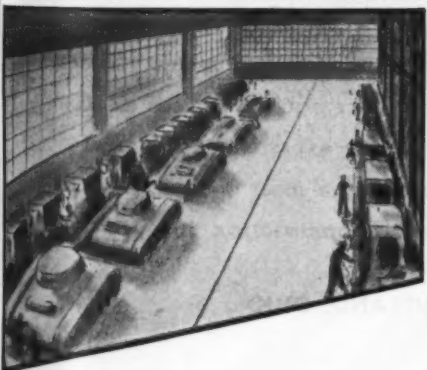
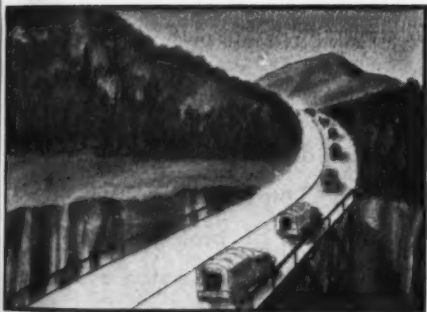
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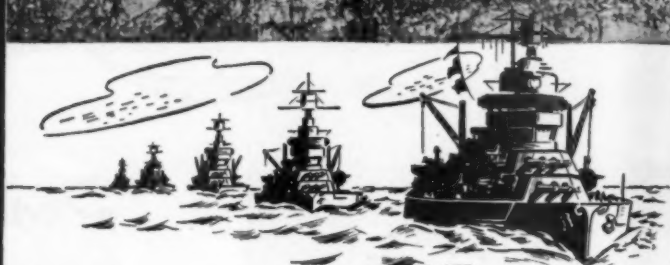
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ROADS AND STREETS

By R. C. CHANEY
June, 1943, Vol. 86, No. 6

A preliminary design sketch showing junction of Newburgh and Willow Freeways, two of the first projects in the Cleveland Freeway Program. Perspective sketches such as this, attractively presented with water-color tinting, have been valuable aids in explaining and "selling" proposed designs to groups of local officials, business leaders and property owners.



**OHIO SPEEDS
ADVANCE
PLANNING**

Progress Story Presented on Pages 40-44

Cleveland Freeways a Major Problem

Metropolitan Cleveland selected as a major objective in reconditioning the State's system by the Ohio Department of Highways under Director Hal G. Sours.

By R. C. CHANEY
Regional Planning Engineer,
Ohio Department of Highways,
Cleveland

THE long suffering people of Cleveland and environs can look forward to a post-war day when community life will be distinctly better, thanks to encouraging progress with the Cleveland Freeway Program. Definite relief from congestion will be a reality under this plan. And incalculable benefits in terms of time and money saved to motorists and truckers, in stimulation of business growth, and in broader social terms will be the reward.

Cleveland's struggle to burst the yoke of a horse-and-buggy street system in the past has followed a familiar pattern of piecemeal effort. True, the city and its suburbs have widened certain streets, affording some local relief. The county has contributed notable improvements, chief of which is the Main Avenue viaduct bridging a depressed industrial area into downtown Cleveland. One section of express-highway, Bulkley Boulevard along the west-side lakefront, built by the state, has given a foretaste of the potentialities of the modern freeway or limited way. But an integrated plan was lacking.

Then the Cleveland region was made the objective of a planned attack upon Ohio's toughest traffic problem by the Department of Highways.

What is this Plan? How were its elements arrived at, and a definite program of action brought about? What progress has been made in advance engineering, right-of-way acquisition, actual construction? I believe the following brief history and review will be of value to planning engineers and business leaders faced

with similar problems in other cities.

Inception of Freeway Program

Congestion in Metropolitan Cleveland had increased by 1940 until an aroused public demanded action. This feeling had crystallized into local acceptance for a program embracing six separate improvements pointed at relief of serious congestion. In April, 1940, the Cuyahoga County Board of Commissioners adopted a resolution for the issuance of \$4,500,000 in bonds to share in a county-state-federal improvement program, to be financed through a general levy over a maximum of 25 years.

In May, 1940, the bonds were voted at a primary election. The following statements of purpose were issued prior to this election:

"\$14,500,000 worth of highways at the cost of right-of-way only, and no increases in taxes."

"Greater Cleveland must have these six modern highways to uncork traffic jams . . . cut driving time . . . shorten public transportation schedules . . . and for greater safety."

"Will give over 250,000 weeks of work" (an effective appeal in 1940).

"Bonds endorsed by political, labor, business and suburban groups and organizations through the county."

Prior to the bond passage, the county sought the cooperation of the state, and the Ohio Director of Highways entered into a verbal commitment with the County Commissioners, the County agreeing to undertake

acquisition of right-of-way, the state to construct the projects with federal aid. The city administration of Cleveland, by a supplementary agreement, pledged \$500,000 additional toward right-of-way for a portion of one project, Willow Freeway, negotiations for the land being made at this time. One section of this project on land purchased by the County is now under contract.

The Ohio state legislature in its 1941-42 session passed a Freeway Act authorizing the Director of Highways, County Commissioners and municipal authorities to "lay out, establish, acquire, open, construct, improve, maintain, regulate, vacate or abandon" the use of freeways and construct service highways for adjacent areas. The Freeway or "limited access highway" is defined in the Act as "a road, highway or street specially designed for through traffic, over which abutters have no easement or right of access by reason of their property abutting, and to which access may be allowed only at intersections designated by the Director of Highways or officials of local subdivisions to eliminate cross-traffic." The legal importance of this definition is obvious.

The Director of Highways immediately undertook surveys and planning of the Freeways. A special planning office was established at Cleveland, design and survey personnel began work, and the Highway Planning Survey began a comprehensive survey of Metropolitan Cleveland traffic.

Why Past Progress Was Slow

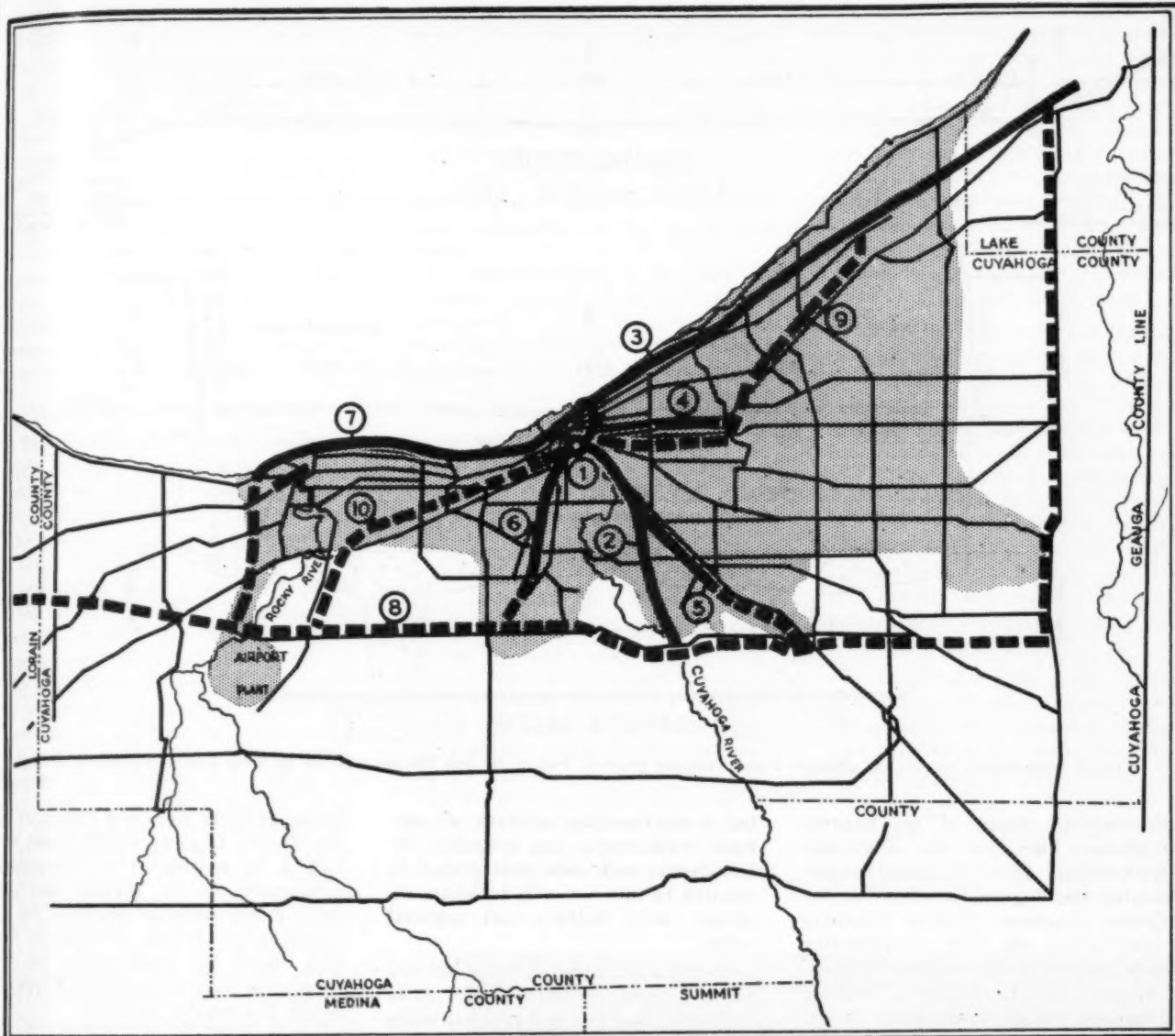
Cuyahoga County embraces scores

Reprints of This Article Available

Whatever your work in roadbuilding, municipal engineering or contracting, it will pay you to read this revealing article. For all highway progress after the war will hinge partly on how soon big-city congestion can be relieved, thus giving new wings to motor transportation as a whole. The national need is for a balanced program of highway development—local and secondary, primary and

inter-regional, and urban. But of these phases, the urban is the most complex, difficult of solution, and often the most urgent.

This article should make absorbing reading for editors, business leaders and other influential citizens in your community. Reprints for distribution will be supplied at nominal cost if ordered promptly. Write us for details.—Editors.



Cleveland's Freeway Program. This map can only hope to show general pattern and length (approx.) of the various projects. 1—Central Interchange. 2—Willow Freeway. 3—East Shoreway (or Lakeland Freeway). 4—Chester Avenue. 5—Newburgh Freeway. 6—Wooster Freeway. 7—West Shoreway (Rocky River Freeway). 8—(Later project) Brookpark Bypass Highway. 9—(Later) Eastern Express Highway. 10—(Later) Western Express Highway. Proposed future regional connections out over state not shown. Shading indicates heavily populated areas (75% or more occupied)

of political and administrative subdivisions and many state and federal agencies, all of which intermesh or act separately in more or less integrated governmental functions. These units, with the unavoidable duplication of effort, restrictions of scope, varied objectives and conflicting interests, constitute a potential handicap to community enterprise and effort common to large cities.

The policies and activities of the individual units do not always coincide nor do they have the metropolitan point of view in all things. Conflicting interests have not advanced civic achievement as a planned and concerted undertaking.

The multiplicity of function may be suggested by the following partial list:

- 1 County Government
- 14 City Governments
- 38 Village Governments

- 6 Township Governments
- 17 Sanitary Sewer Districts
- 1 County Board of Education
- 14 City Boards of Education
- 18 Village Boards of Education
- 1 County Planning Commission
- 22 Local Planning Commissions
- 19 Boards of Zoning Appeals
- 1 Metropolitan Park Board
- 1 Metropolitan Housing Authority
- 1 Regional Association
- 1 Cleveland Port and Harbor Commission
- 1 Cleveland and Transit Commission
- Numerous State and Federal Agencies

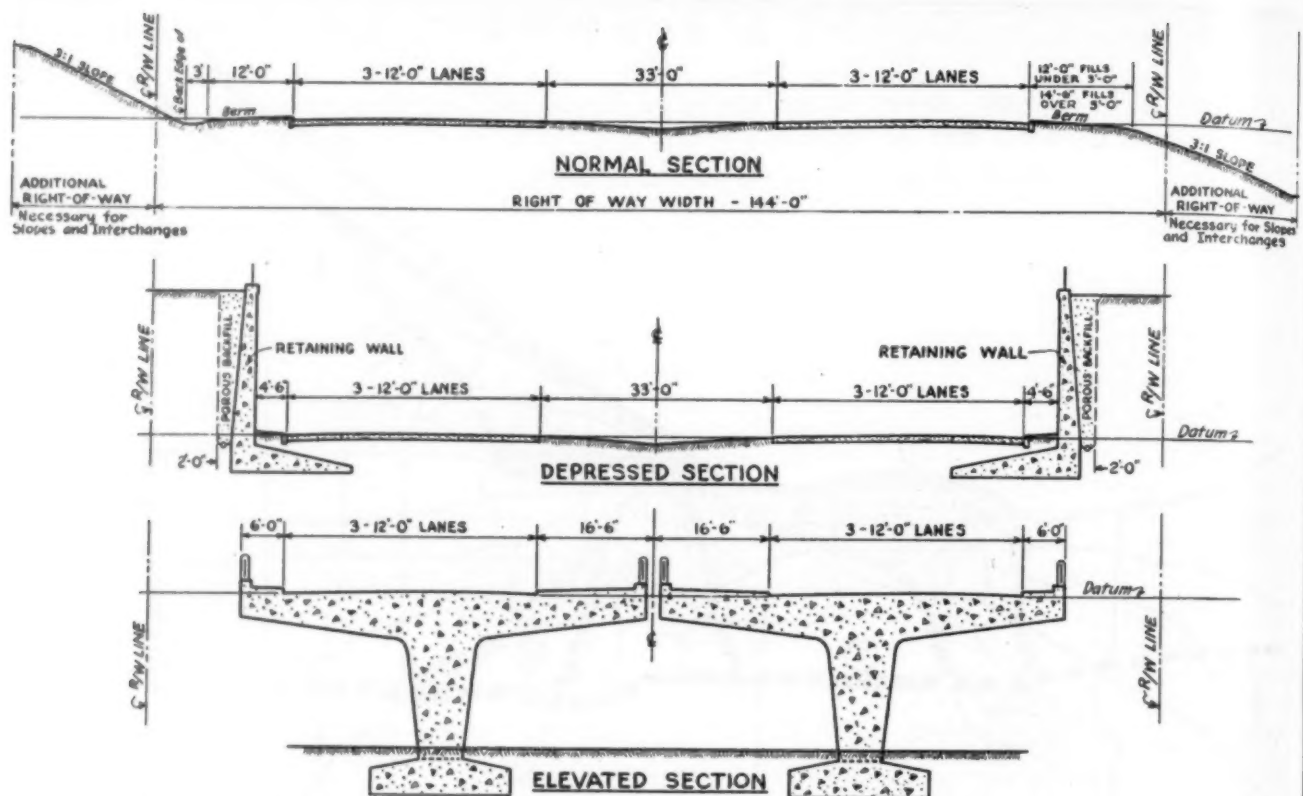
a total of more than 150 official and separate units of varying purpose and authority.

The Cleveland Metropolitan District, as recognized by the U. S. Census, includes, in addition to the central urban units, all adjacent minor civil divisions or incorporated places. It corresponds to the area of common economic, social and administrative interest. The district excludes the sparse portions of Cuyahoga County,

but extends east into Lake County. Its area is 338 square miles and its population in 1940 was 1,214,943, having increased 19,954 or 1.7% in the preceding 10-year period.

Planning and Design of Projects

Under the auspices of the Cleveland Regional Association, in October, 1940, a Committee on Public Works was created as a coordinating agency. Represented on it were the City of Cleveland, Cuyahoga County, the Ohio Department of Highways, Metropolitan Parks, the County Planning Commission, the County Highway Council, Chamber of Commerce, Cleveland Engineering Society, the American Society of Civil Engineers and the Works Progress Administration. In June, 1941, a subcommittee was designated, later titled the "Committee for



Typical cross-section studies for ultimate 8-lane Freeway project. Future 7th and 8th lanes to be on inner side of pavement shown

Engineering Study of an Express Highway Plan for the Cleveland Metropolitan Area." Engineers representing the Regional Association, the County Engineer, County Planning Commission, the City (engineering and planning staffs) and the Ohio Department of Highways (Cleveland Planning Office) undertook to supply the lacking directive for the critical central section features of the Freeway Program and a "control" highway plan for the metropolitan area.

The six bond-issue projects were to be express ways, designed to relieve radial arteries. Further study of these projects as originally conceived soon showed that they, alone, were not capable of eliminating congestion in Cleveland.

In fact, in some cases they threatened to increase congestion. Three of the projects were directed to, but stopped two or three miles short of, the central section. The intervening streets were well below freeway standards, and included two old bridges, 1,500 and 3,600 feet in length (the latter since removed). Any increase in traffic-delivery capacity into the central section would further burden the already-overloaded heart of the city.

Yet all six original projects were aimed at serious local difficulties that urgently needed correction. The necessity was seen, first, for develop-

ing a metropolitan network of ultimate traffic-ways; and secondly, for considering each individual project in relation to this network, to insure its proper scale, balance and regional value.

Cooperative study of these six and other possible projects by the state and local planning agencies was made toward an "Express Highway Plan for Metropolitan Cleveland."

Ten Integrated Projects

When the six projects were reconsidered as parts of the regional need, the natural thing happened. They soon emerged as more adequate (and costly) undertakings having entirely new characteristics and scale. And to them were added four additional projects. The State urged the development of a great central interchange of Newburgh and Jennings Freeways with the existing principal streets (Lorain, Carnegie, Woodland, East 9th and Ontario). The fitting of the freeways into this central situation involved not only existing ways, but also the problem of the disposition of the condemned Central Viaduct (near downtown) as well as two new major ways contemplated for some years—the Shaker Boulevard and the Cedar Avenue Relief Project; and the recognized necessity of an inner distributing way in the general location of East 14th and East 26th Streets.

These projects were not embraced in the State's freeway commitment but had to be considered as prospective components of the overall plan and their traffic purpose provided for in planning the central interchange. For that reason the State asked the collaboration of local agencies in crystallizing the control network.

The ten "first order jobs" comprising the present planning objective are as follows:

Central Interchange

Radial Arteries:

- Willow Freeway
- East Shoreway (or Lakeland Freeway)
- Chester Avenue
- Newburgh Freeway
- Wooster Freeway
- West Shoreway (or Rocky River Freeway)

No definite priority has been established. All are important but their order and timing must depend upon conditions now uncertain.

Later Projects:

- Brookpark By-pass Highway
- Eastern Express Highway
- Western Express Highway

The stipulation that each project contribute to the larger plan implied no lessening of its local value, but rather an increased benefit. As re-study progressed, the total of 10 miles in various links of the original Free-

way Program was doubled. Design standards were adopted which greatly increased the traffic capacity, service and cost. Three projects were extended into the central section. In the engineering approach to the problem, minimum construction cost was not held to be a primary consideration, nor was the program thought of as a boulevard or parkway scheme. Utility and transportation-economy were the primary purposes—purposes underlined in recent months by the new necessity for high fluidity of vehicular transportation in this great industrial community in time of war.

Standards and Characteristics

The objectives "facility, economy and safety" for Cleveland traffic called for a major operation on the city's typical grid-iron of local streets. The remedy chosen was not to widen a large number of streets, but to add a system of relief ways; not to rebuild miles of frontage developments, but to remove the overload from streets now inadequately serving the city's development, by diverting traffic to new roadways designed for streamlined, non-stop flow.

From the outset, the traffic-capacity, length and principles governing design of facilities, were scaled to reflect the most advanced contemporary express highway design. The express highways around New York, Chicago, Detroit and elsewhere were studied in this connection. It was seen that only the use of limited-access highways, with separated directional movement, adequate collection and distribution facilities, highest standards of grade and alignment, provisions for future added capacity, landscaping, and fitness for the future development of the region traversed, would answer the Cleveland need.

Widening of existing streets was never seriously considered for obvious reasons. The provision of brand new ways opened up opportunity for searching for the most economical rights-of-way, for developing roadway designs with a free hand, and especially for organizing traffic movement to allow mutual relief to both main-line traffic and local access and circulation vital to normal business. The addition of totally new ways, of course, would impose some serious effects; disturbance of utilities, for example. But it was realized that civic advancement and economic benefits over a long period would cause these immediate difficulties to be forgotten.

The characteristics necessary to assure a practical maximum of relief from a system of added ways may be suggested by analysis of the causes of accidents, the reasons for traffic time-

waste, the existing streams of movement, distribution of employment and of workers' homes, the point-to-point movement of freight haul, and prospective trends in shifts of population and industry. These considerations "boil down" to stipulations as to:

1. **Characteristics of the plan:** to systematically serve the entire area with adaptability to future changed needs;

2. **Characteristics of the line:** its strategic location for collection, distribution and utility in serving traffic streams; its alignment, gradient and provision for access and for connection with other lines; its location as to economy of effect upon existing and prospective land use;

3. **Characteristics of the way itself:** its cross-section, surface, lighting, drainage, etc.; its provision for elimination of traffic friction.

Head Start on Topographic and Traffic Surveys

First, of course, was the job of completing the extensive surveys. Federal programming for advance planning under Highway Act funds made it possible to include part of the Freeway Program in the Ohio state highway program for post-war work.

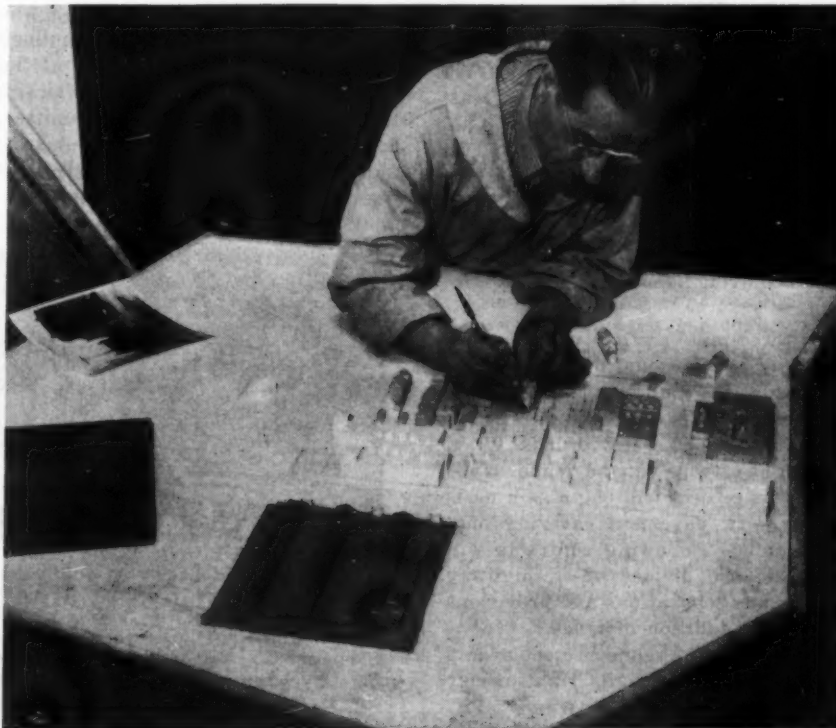
Before present traffic ills could be properly diagnosed and prescribed for, it was necessary to make a general study of the Metropolitan area and to

look into all suggested remedies. This was the job of the state. An inventory of available map data, traffic counts, roadway records, population, property and land-use statistics was made, showing Cleveland to be unusually well provided. Studies for various contemplated improvements had already been made by the county, City of Cleveland and other agencies. However, no local agency being able to finance full preliminary engineering, much work was left to be done.

The special need was for accurate maps embracing alternate routes, giving the physical conditions required for location study. The Cleveland Geodetic Survey was found to have a large part of the horizontal and vertical control data needed, and had begun topographic mapping by plane table survey. The State's sponsor personnel joined in this work to greatly expedite it, and through the Survey's hearty cooperation high grade control and topography were obtained.*

To supplement past traffic counts, the Highway Planning Survey made a study of traffic origins and destinations, prospective densities, etc. The Cleveland Planning Office studied in-

*As many as 17 state survey parties have been employed, and a maximum of 208 employees required in the state's Cleveland planning office.



At work on a small-scale plaster table model of proposed central interchange. To aid in also making a "present-situation" model, aerial maps and over 250 ground photos were taken of old structures now occupying the quarter-square mile area of the interchange

dustrial trucking, worker movement, peak lane use, and other important traffic elements. Survey data were used as they became available, in applying design principles to various alternate routes, as a means of comparing tentative solutions. In one case as many as seven variations of location were laid down and estimates made of their construction cost, property cost, curvature and other characteristics. Considered also were general engineering feasibility, effect on established or future land use, suitability as to feeder connections, fitness in relation to the general traffic plan.

Projects were discussed with all interested officials, groups and individuals, as work went along, there being no single steering or clearing agency representing the entire community in the Freeway Program. Final adoption of the project plans followed after public hearings and separate legislative consents of the municipalities traversed, as required by the law of Ohio.

For consideration by the County and other governmental units, the State's proposal of a specific project consisted of a Map-Plan and a Right-of-Way Plan, with description, showing actual characteristics of the design. Perspective drawings of special features were supplied. The Map-Plan consisted of a topographic map of the line (1" to 100') on which the proposed freeway was overlaid in color.

Present Status

Contract for an 8800-ft. section of Willow Freeway (ultimately to be about four miles in length) was awarded for grading, drainage and certain structures. The contractor has made some progress on this \$1,400,000 job, in spite of the long, wet spring. The County bought the right-of-way for the first section, and the city is now acquiring land for the next section.

A three-mile section of Lakeland Freeway in the suburb Brotenohl, a step toward improvement of the strategic trans-state route parallel to the Erie shore, is ready for bids. When the right-of-way can be made available, this project will begin as a first-stage 24-ft. pavement carrying one-way traffic. Following contracts will complete the divided 48-ft. highway with grade separations and provisions for future addition of lanes.

The Chester Avenue project awaits agreement for design, right-of-way acquisition and detail drawings.

Post-War Program

Construction of the Cleveland Freeways, as funds became available for

them as Federal Aid projects, however, has been very seriously affected by the restrictions upon funds and materials imposed by the war. The greater portion of the construction naturally must be deferred.

The war will end and be followed by an adjustment whose duration and conditions can only be forecast in some relation to those of the last war. To some degree it will be necessary to "take up slack" in national income by created employment; that is, by some type of public works. This may be so programmed as to combine useful spread and circulation of income with the accomplishment of needed improvements. Such a program may be made embrace much reconditioning of urban and regional transportation facilities. The current planning of a National System of Inter-Regional Highways will provide a "screen test" of need and priority for sound selection of projects toward solving the urban bottleneck.

Acknowledgments

The State's planning and construction of this work is under Director of Highways Hal G. Sours, with G. R. Logue, Assistant Director and Chief Engineer; M. D. Shaffer, Chief Engineer of Location and Design, and W.

S. Hindman, Chief Engineer of Bridges. C. H. Makeever is Chief Engineer of the Ohio Highway traffic survey and G. E. Strauss, Right-of-Way Engineer. The surveys, planning and design, except bridges were handled by the Cleveland Planning Office, of which R. C. Chaney is Regional Planning Engineer in charge with N. M. Wilke, Engineer of Design. Construction of the projects is the function of Division Engineer R. E. Williams, Cleveland. C. E. Swain is District Engineer, Public Roads Administration. W. V. Buck is engineer in charge of PRA Columbus sub-office.

Among local officials directly collaborating were: County Commissioners Joseph F. Gorman, John F. Curry and James A. Reynolds, constituting the "Party of the First Part" in the State's original Freeway commitment, whose interest throughout has been active and most cooperative; County Engineer Jno. O. McWilliams and his chief deputy, W. E. Blaser; Chairman of the County Planning Commission, E. A. Fisher, City Engineer of Lakewood; Cleveland's Planning Director J. T. Howard, and Commissioner of Engineering J. C. Wenrick; Geodetic Survey Director Burks Oakley and Asst. Director Brooks Ernest in immediate charge of the Survey.

Associated Equipment Distributors Hold Conference

To cooperate with the war effort the usual general meeting of Associated Equipment Distributors was confined this year to a streamlined conference. Meeting June 7-10 at the Edgewater Beach Hotel in Chicago the A. E. D. executive committee, board of governors and a few manufacturer executives discussed legislation and other internal problems.

A.G.C. Boards to Meet in Chicago

The Governing and Advisory Boards of The Associated General Contractors of America will meet at the Drake Hotel, Chicago, June 28 and 29. Meetings of the A.G.C. Secretaries' Council will be held both on June 27 and 30.



The Associated Equipment Distributor's board meeting, snapped June 9 at Chicago. In this scene are Ed. P. Phillips (president), Phillips Machinery Co., Richmond, Va.; Geo. W. Van Keppel (1st vice pres.), Geo. W. Keppel Co., Kansas City, Mo.; H. O. Penn (2nd vice pres.), H. O. Penn Machinery Co., New York City; Frank McBath, Columbia Equipment Co., Portland, Ore.; W. H. Bacher (treas.), R. E. Brooks Co., New York City; Carol Winchester (exec. secy.), Washington, D. C. Also the following directors: Julian Gilman, of Wm. H. Ziegler Company, Inc., Minneapolis, Minn.; Wm. A. Danner, of Parker, Danner Co., Boston; Albert Hahnman, of Tractor Machinery Co., Atlanta, Ga.; Geo. A. Cooper, of J. E. Ingram Equipment Co., San Antonio, Tex.; Reuben S. Rosholt, of Thorman W. Rosholt Co., Minneapolis, Minn.; and John Beynon, of Brown-Bey, Los Angeles, Calif. Not present at time of photo were directors R. S. Patten, of Patten Tractor & Equipment Co., Chicago, Ill.; James C. Alban, Alban Tractor Co., Inc., Baltimore, Md., and Chas. O. Finn, Finn Equipment Co., Cincinnati, Ohio.

County Road Problems in "North Country"

How county highway department helps serve vital logging charcoal and mining industries in Northern Michigan

By K. I. SAWYER

County Engineer, Marquette County,
Ishpeming, Michigan

ROADS near big industrial cities aren't the only ones that have a special importance in wartime. Up here in Northern Michigan, keeping the roads open and in good condition is all the more necessary today for a number of reasons.

One is the critical need for structural timber for local iron mines and for shipment to war industries. Marquette County's millions of acres of forests are dotted with isolated lumber camps. Most of these camps are really "back in the woods" and reachable only over logging trails which are normally not kept cleared of snow through the winter.

An important part of our work this spring was the clearing of these trails so that logging could get off to the earliest possible start. An idea of the distances we have to cover is gained by realizing that Marquette County covers 1874 sq. mi., or nearly twice the area of Rhode Island.

Tractor plows are used principally for opening up our logging roads. This year it was May 14 before the job was finished due to the remarkably heavy snowfall and late spring storms. A tractor with V-plow was hauled on a trailer to one 9-mile logging road, where it operated because of heavy, hard snow for three nights and two days in mid-May to get choppers in and started on a war contract.

This year in spite of the danger of considerable roadway damage, weight restrictions were lifted earlier than normal to let log trucks out. Char-



Marquette County Engineer K. I. Sawyer, and his assistant Bill Gray, measuring frost-heave of a culvert

coal plants—we're a big producer—ran out of supplies late this winter and there was a hurry call for loads of logs to keep this essential wartime product in peak production.

Local mining also presents a special pattern of highway service need in our part of the country. Marquette County is one of the world's great producing centers for high-grade copper iron ore. It is necessary to keep all roads between mining towns and to the mines open all winter. Snow-clearing of streets in the many small unincorporated mining and lumber towns is also the county's responsibility.

A third factor and one of increasing importance is farming. During the depression years, when mining

was at low ebb, many new widely scattered farms appeared over the county, considerably adding to the all-year traffic importance of certain roads.

And fourth, of course, are our consolidated schools, of which much has been written.

1943 Maintenance, Double Shift

Our current maintenance work comprises several general tasks. Unimproved roads, or roads with little gravel are being reshaped. A big problem is what to do with 80 miles of pit-run gravel lower course surfaces which were built during WPA days. We haven't the money, with our 35 per cent reduction in wartime income, to put on a topping. And since the county has only three known clay pits, there is little chance of clay stabilization. We'll keep these roads bladed as best we can. Every bit of Marquette County shaping equipment is working double shift, to get the most work done with available units.

Our bituminous surfaces, largely tar, are receiving only "maintenance type" or limited-area and spot treatment. Two tar patching outfits have already put down preliminary patching, which is a light penetration or skin patch, followed by chips and small roller. In a typical 8-hour day, one small trailer-type distributor spreads some 12 tons of crushed stone

Tar penetration patching in Marquette County, Michigan, is being done with two trailer-type distributors. Photo, May, 1943



ROADS AND STREETS, June, 1943



Marquette County's modern garage and office building at Ishpeming, Mich.

and applies 250 gal. of patching tar over 4 to 6 miles of road.

Frost Raises Culverts and Corduroy

Maintenance this spring has been complicated by the unusually heavy frost, which caused culverts to work up 12 to 18 inches in many instances. About fifty culverts have had to be re-installed to normal grade. And all over the county we've had an unusual "crop" of old corduroy logs. Buried in the road since pioneer days, these have worked up, often bulging through a foot of bituminous surface, and must be picked out and the holes patched. Along one road this spring we even had a row of sawed-off telegraph poles rise like submarine periscopes along the centerline—inheri- tance from some forgotten day.

Upper Michigan Counties, too, have their eyes on the post-war need. If and when unemployment hits the nation, it will hit us hard. At the 1931 peak we had 5,400 mining and lumber families on relief. If this has to happen again, we'll be ready with a reservoir of needed road projects.

F. M. Limbaugh Is New State Highway Engineer of New Mexico

F. M. Limbaugh, of Albuquerque, former District Engineer of Highway District No. 3, with headquarters in Albuquerque, was promoted to State Highway Engineer, effective May 1. Mr. Limbaugh succeeds Burton G. Dwyre, who resigned to enter private employment.

Mr. Limbaugh has spent over 19 of the past 22 years in the employ of the Highway Department. He was first employed in 1921. In 1926 he was appointed a Project Engineer and served in this capacity until 1933. From 1933 to 1935 he served as Assistant District Engineer at Albuquerque and Santa Fe. From 1935 to 1938 he served as Assistant State Highway Engineer in charge of construction, then resigned to enter private employment. He returned to the Highway Department in April, 1941, to become Assistant District Engineer at Deming, becoming District Engineer at Albuquerque July 15, 1941, in

which position he served until his appointment last month as State Highway Engineer.

Mr. Limbaugh was born in Cape Girardeau, Mo., on June 23, 1898, and has lived in New Mexico since 1906.

President O. K.'s Funds for Flood Repair

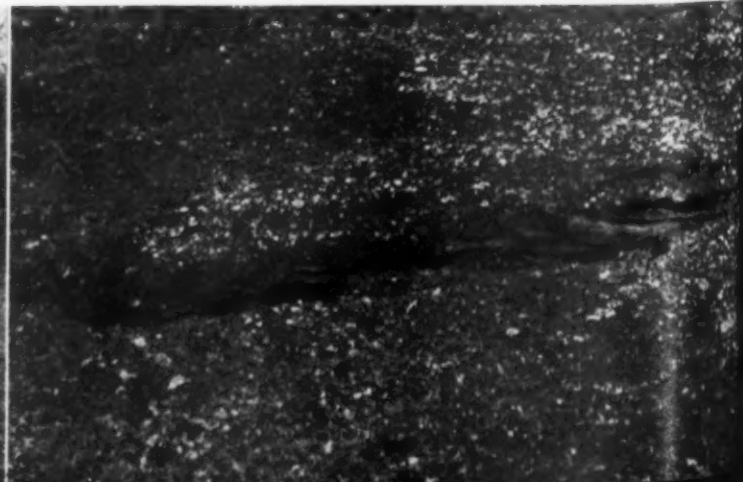
Federal-aid funds which have been piling up as a result of curtailment in new road construction can be used to repair middlewestern flood-damaged roads, as a result of a move by the President. All unobligated funds in the states involved are available for this work on an equal matching basis.

Extensive flood damage occurred in recent weeks to roads in Indiana, Illinois, Missouri, Kansas, Oklahoma, Arkansas, Texas, Louisiana, Kentucky, Tennessee and Mississippi. Most of these states plan to take advantage of the funds. Estimates of total road damage, which includes destruction of several major bridges, run as high as \$20,000,000 for the area.

Heave-ho! This culvert rose nearly 12 inches during the unusually heavy 1943 thaw



Peak-a-bool Here comes another old corduroy log. These logs, a regular crop in Northern Michigan, are unusually plentiful this year





Making short work of old canal lock masonry

Access Road Follows Century-Old Canal Bed

Removal of old lock masonry, use of gravity-type retaining walls, features of million-dollar rush project.

By JOSEPH A. BYRNES

President, Byrnes-Conway Co., General Contractors, St. Bernard, Ohio

THE following notes cover several interesting features of a short (2.2-mile) but unusual access road job near Cincinnati. This is the so-called Lockland-Arlington Heights section of Ohio state route 987, being rushed to completion through a suburban area this summer to serve the Wright Aeronautical Engine Works.

One feature of note is the use of the abandoned bed of the old Miami & Erie Canal as right-of-way. This circumstance required the removal of three old locks, built of stone masonry on hewn timber grillage about a hundred years ago and reinforced with concrete around the turn of the century. Due to the nearness of adjacent buildings, blasting was not permitted in the lock demolition and removal. We broke up foundation masses by drilling holes and using plug and feather, or with a 2700-lb. ball breaker. A curious incident on this job was the discovery of an ancient jar of home-canned pickles buried deep on the site. The boys declared them edible.

The low level of the canal bed below the locks necessitated a highway grade depressed some twenty to thirty feet for a distance of several

thousand feet. High retaining walls required at right-of-way edges have gravity cross-section to save reinforcing. Walls varying in height from 6 to 32 ft. above footings, were designed with a batter of 1/16 in. per ft. in front and 4 1/2 in. per ft. at back. Walls were concreted in the usual alternate

sections, sections usually being 19 1/2 and 20 1/2 ft. Ready-mixed concrete was used for walls, a considerable footage of which was placed last winter using heated aggregates and tarpaulins.

We moved and set wood form sections with a crane. Each section was moved as a unit, the front, back and two bulkheads remaining assembled. Bulkheads of 3 x 12 in. timbers were kept in place during move-ups by

Gravity-type (no steel) retaining walls have a pleasing appearance, aided by vertical grooves or "fluting" formed in the concrete





Above left: A completed section of the 2.2-mile Lockland-Arlington Heights access road to an air-craft engine works near Cincinnati

Above right: Curved battered wall, which was a bit tough to form accurately

Lower left: Ready-mix delivery expedited retaining wall construction

Lower center: One of several sled-mounted diesel fuel tanks used to supply shovels, cranes, and tractors

Lower right: Sunning themselves during lunch hour on the Lockland

access job. George Lappa, engineer for Byrnes-Conway Co.; Roger Towle, state project engineer; Patrick Hickey, superintendent; Charles Wuest, office engineer. Hickey and Wuest are both old-timers with colorful records. Hickey won fame as a subway contractor in New York, and before that was a pioneer railroad builder (Frisco) out in the Oklahoma Indian Territory in the 90's, believe it or not. Wuest was formerly with the Paving Brick Mfrs. Assn., was chief engineer of a brick concern, and served with the Illinois highway department

The project included 2.2 miles of 4-lane dual concrete pavement; four sections of intersecting street at new grade; and five overhead cross-street bridges, a pedestrian overhead for school children, a service bridge to an industrial plant, and one bridge over a small stream. The roadway consists of two 24 or 26-ft. pavements

with low separation curb and colored concrete or asphalt surfaced center wall. Pavement is of 9-7-7 in. cross section, pavement being thickened on only the outer edges in a width of 2 ft. Most of the pavement was placed and finished in 12-ft. lanes.

The \$1,060,000 contract price also included extensive storm and sanitary

sewers and other drainage, grading, etc., as partly itemized in the accompanying table of quantities and bid prices.

Byrnes-Conway Company, Cincinnati, was the general contractor. Richter Transfer Co. was sub-contractor on excavating and grading, and O'Connell & Sweeney, Inc., on paving.

PARTIAL LIST OF BID ITEMS BYRNES-CONWAY CONTRACT

Contract let May 19, 1942; specified completion date, June 30, 1943. Project FAD DA-WI-7A, State Route 986, Hamilton County, Ohio.

BID ITEM	Unit	Price
(Grading and Drainage)		
213,250 cu. yd. roadway excavation (unclassified)	cu. yd.	\$ 0.50
30,614 cu. yd. channel excavation	cu. yd.	.60
1,195 sq. yd. removal and disposal existing conc. pvmt.	sq. yd.	.40
2,929 sq. yd. removal and disposal existing brick pvmt., sand cushion and conc. base	sq. yd.	1.00
134 lin. ft. 6" plain conc. pipe storm sewer (M-6.5)	lin. ft.	1.35
1,097 lin. ft. 12" plain conc. pipe storm sewer (M-6.5)	lin. ft.	2.00
466 lin. ft. 15" plain conc. pipe storm sewer (M-6.5)	lin. ft.	2.75
731 lin. ft. 18" plain conc. pipe storm sewer (M-6.5)	lin. ft.	3.25
674 lin. ft. 36" reinf. conc. pipe storm sewer under pvmt. (M-6.6)	lin. ft.	8.00
2,358 lin. ft. 12" reinf. conc. pipe storm sewer under pvmt. (M-6.6)	lin. ft.	2.50
43 lin. ft. 12" reinf. conc. pipe storm sewer under pvmt., roadway drainage, porous backfill	lin. ft.	3.50
1,284 lin. ft. 6" bell & spigot plain conc. pipe under-drains (M-6.5)	lin. ft.	.75
6,154 lin. ft. 6" bell & spigot plain conc. pipe under-drains under pvmt. (M-6.6)	lin. ft.	.75
3,994 lin. ft. 4" to 24" pipe removed and disposed	lin. ft.	.75
8,904 sq. ft. 4" conc. one-course walk	sq. ft.	.25
105 lin. ft. 15" r/c pipe storm sewer under pvmt. (M-6.6)	lin. ft.	3.25
395 lin. ft. 18" r/c pipe storm sewer under pvmt. (M-6.6)	lin. ft.	3.75
115 lin. ft. 30" r/c pipe storm sewer under pvmt. (M-6.6)	lin. ft.	7.00
73 lin. ft. 36" r/c pipe storm sewer under pvmt. (M-6.6)	lin. ft.	8.50
744 lin. ft. 12" bell & spigot conc. pipe, porous backfill, bottom half sealed (M-6.5)	lin. ft.	3.00
504 lin. ft. 15" bell & spigot conc. pipe, porous backfill, bottom half sealed (M-6.5)	lin. ft.	3.75
574 lin. ft. 18" bell & spigot conc. pipe, porous backfill, bottom half sealed (M-6.5)	lin. ft.	4.75
375 lin. ft. 21" bell & spigot conc. pipe, porous backfill, bottom half sealed (M-6.5)	lin. ft.	5.00
872 lin. ft. 24" bell & spigot conc. pipe, porous backfill, bottom half sealed (M-6.5)	lin. ft.	5.50

390 lin. ft. 27" bell & spigot conc. pipe, porous backfill, bottom half sealed (M-6.6)	lin. ft.	6.00
760 lin. ft. 30" bell & spigot conc. pipe, porous backfill, bottom half sealed (M-6.6)	lin. ft.	8.00
194 lin. ft. 36" bell & spigot conc. pipe, porous backfill, bottom half sealed (M-6.6)	lin. ft.	9.50
476 lin. ft. 12" bell & spigot r/c pipe	lin. ft.	3.50
355 lin. ft. 15" bell & spigot r/c pipe	lin. ft.	3.75
555 lin. ft. 18" bell & spigot r/c pipe	lin. ft.	4.75
209 lin. ft. 27" bell & spigot r/c pipe	lin. ft.	6.00
500 tons traffic-bound surface course, temp. roadway	tons	4.00
10 tons calcium chloride	tons	50.00
5.46 MBM creosoted bridge timber	cu. yd.	150.00
730 lin. ft. creosoted 12" piling	lin. ft.	2.50
666.5 sq. ft. precast cellular retaining wall	sq. ft.	4.00
6,606 cu. yd. unclassified embankment	cu. yd.	2.50

(Pavement)

278 sq. yd. 1 1/4" insulation course	sq. yd.	0.25
1,017 lin. ft. furnishing & incorporating red coloring material in conc. curb—(2A type)	lin. ft.	0.05
3,644.8 lin. ft. furnishing & incorporating red coloring material in conc. curb—(4A type)	lin. ft.	0.05
332 sq. yd. 6" conc. paved drives & approaches	sq. yd.	2.50
381.6 sq. yd. 6" conc. paved median strip	sq. yd.	3.00
3,826.4 sq. yd. 7" conc. pavement	sq. yd.	2.50
149.7 sq. ft. 9-6-6" conc. pvmt.	sq. ft.	2.50
119.3 sq. yd. 10" ave. depth, conc. track pvmt.	sq. yd.	9.00
1,226.1 sq. yd. 13-14-13" conc. median strip	sq. yd.	4.00
1,089.5 sq. yd. 18-18 1/2" conc. marginal strip	sq. yd.	5.00
45,373.3 sq. yd. 9" conc. pvmt.	sq. yd.	2.75
33 sq. yd. 11" conc. pvmt.	sq. yd.	3.10
2,252 lin. ft. type 2A curb	lin. ft.	.45
16,806 lin. ft. type 4A curb	lin. ft.	.55
445 lin. ft. type 2 curb gutter	lin. ft.	1.35
10,934.9 lin. ft. type 4 curb gutter	lin. ft.	1.25
5,241 sq. yd. furnishing & incorporating red color in conc. pvmt.	sq. yd.	1.00
1,997.9 sq. yd. 9-7-7" conc. pvmt. deceleration lanes	sq. yd.	2.60

Critical Road Conditions—II

Continuing a series of war-time maintenance reports

California—Heavy Trucks Cause \$10,000,000 Damage

FROM T. H. Dennis, maintenance engineer, California division of highways, and G. T. McCoy, state highway engineer:

The following data are submitted regarding our Maintenance Program for the current year and its adequacy under the existing conditions.

Prior to Pearl Harbor, a State Planning Survey revealed that 65 per cent of the highways and 27 per cent of the structures on the rural state highway system were inadequate for traffic, and that some \$250,000,000 of additional revenues would be required for their rehabilitation.

Today, with revenues reduced 40 per cent, we still have our former problems and, in addition, those created by the heavy hauling attendant the unprecedented construction of military facilities and war plants, and the stimulated production of mineral, agricultural and forest products. These activities, coupled with the disruption of coastwise shipping, restricted rail shipments and the increased civilian and military demands at defense plants and cantonments, have completely altered the pattern of heavy commercial traffic. While automobile traffic decreased some 28 per cent, heavy commercial traffic and its average load increased 30 per cent over the 1940 high. Truck loads of over 20 to 25 tons have likewise risen from approximately 25 for each 1,000 trucks, to 80 per thousand in 1942. Axle loadings in excess of 22,000 lbs. have also increased approximately 50 per cent for the same period.

As a result of the above factors, some \$10,000,000 damage was suffered by our secondary and main highways, which were not designed for the repeated and heavy loading to which they were subjected. The unfortunate part was our inability to keep up with their repair. Contractors evinced little interest in highway work, since the defense and military projects offered better prices and no uncertainty as to labor, equipment and materials. As a result, repairs were limited to the ability of our Maintenance organization, already handicapped by restrictive allocations of equipment and materials and the loss of some thirty per cent of their trained personnel to the armed forces and the higher-paid war industries.



This serious slide occurred this spring near Jackson, Wyoming. State Highway Superintendent C. F. Seifried, in sending in the photo, reported several such slides

Repair Work Piles Up

Thus we face 1943 with some 65 per cent of the \$10,000,000 1942 damage still to be repaired, though the marked reduction in this year's defense program promises a livelier interest on the part of contractors in our highway work.

During the present fiscal year, there will be some \$9,570,000 available for routine and specific maintenance, which represents a decrease of 11 per cent over a similar period in 1942. Owing to the limitations of L-41, construction funds to the extent of \$3,600,000 will be devoted to heavy patching and light blanket work, and contracts on these projects are now being advertised. Under the combined program, it is expected to place light

bituminous blankets over 421 miles of highways, recondition with light oil increments 214 miles of roadway and 280 miles of shoulders adjacent the pavement, in addition to placing 476 miles of seal coat. The bituminous material required consists of various grades of cutback asphalts, asphaltic cement and emulsions, the total 76,000 tons being roughly divided in the ratio 44 per cent maintenance and 56 per cent construction.

The various directives and limitations on materials and design have inaugurated and necessitated a number of changes. Mud jacking is now being resorted to in lieu of a cushion course on portland cement concrete pavements which show evidence of pumping and deterioration under heavy and repeated loadings.

The freezing of slow-curing road oils has made necessary the establishment of storage and heating facilities for handling the heavier products. Storage of plant mix of the medium-curing asphalts instead of the slow-curing products limits their period of usefulness and imposes a change in the time of work.

The restrictions on rubber and speed have advanced the use of finer screenings, and even sand, as cover on seal coats.

Traffic stripes are now dashed, and cold-water paints are often used on transient work. Masonite has been substituted for steel on all traffic signs.

On roadside fire prevention work, discing is, to a great extent, taking the place of Diesel oil applications and burning.

Many mountain roads receive but periodical maintenance, their crews being shifted to valley sections as replacements for those who have left the service.

Flood Damage in Missouri

Special dispatch from office of C. W. Brown, chief engineer:

During May, Missouri was visited by one of the most disastrous floods in its history. At the peak on May 21 and 22 state highways were blocked with water at 123 separate locations, and there were other places where the highways were under water, but traffic was still able to move with safety.

The greatest part of the cost of flood damage was concentrated at two points—on Medicine Creek, Livingston County, and on Loutre Creek, Montgomery County, where a 360-foot bridge was completely washed out. The remainder of the damage was over scattered locations, and consisted of bridge approach fills and riprap being washed out, as well as a great deal of damage to shoulders. The total cost of proper replacement is estimated at \$420,000.

Repair work has been started at many locations and will be rushed to completion. Much of the work will,

of necessity, have to be done by maintenance forces, but some of the larger projects will probably be let to contract after necessary arrangements have been made with the Public Roads Administration.

Construction Hauling Damages Shoulders in R. I.

From Rhode Island comes the following report by H. C. Thierfelder, senior highway engineer:

As with most states in this vicinity, severe winter conditions and heavy concentrated traffic have more than usually produced cumulative deterioration in some of our main routes.

On some of these routes hauling of materials for incidental war-base construction has seriously affected the shoulders and pavement. Some of these will be repaired by the agencies causing them, but a great deal of the pavement will need maintenance work until such a time as materials and equipment and labor are available for a reconstruction job.

About \$1,735,000 is available for expenditure on the state system, 97 per cent of last year's amount. We have 806 miles of all types on the system and expect to maintain the entire mileage.

The town and local road situation is about the same as usual except that materials are hard to obtain, especially the asphalts.

We estimate a call for 250,000 gallons asphalt; 440,000 gallons of tar; 650 tons of calcium chloride; 1200 bags of cement—all for maintenance. No stop-gap methods have been tried as yet. We are trying to carry on as usual.

Maintenance Up 25% in Oregon

The 1943 maintenance picture for Oregon is given herewith by E. A. Collier, maintenance engineer, Oregon state highway department:

Oregon had a big New Year's flood in the Willamette Valley and unusually deep snow fell on the summit of the Cascade Mountains last winter. The movement of logs on trucks has increased enormously and the increase

in tonnage of freight hauled by contract carriers over the highways of this state has been very material.

However, on May 1 the surface of the State Highway System was in better condition than a year ago. There were a few sections in poor shape due to the heavy truck traffic on light surfaces. Most of the damage is charged to the overloading of trucks which causes corresponding destructive stress in the highway surfaces and bridges. Weighmasters are employed to check the weights of loads but overloading violations occur much more often than they should. These caused great damage to the highway surfaces during the winter and spring months.

The maintenance budget for 1943 is \$5,460,000, 25% above 1942 expenditures. This increase appeared necessary to cover higher costs of mineral aggregate, supplies, and wages and to cover additional work required due to extra heavy truck traffic, both civil and military.

The total of primary and secondary highways is 7,141 miles. It is planned to use 31,620 tons of asphalt for patching and re-oiling this year. Very little, if any, betterment can be performed. The maintenance forces will be concentrated on keeping the bridges safe and the surfaces of the highways in a reasonably smooth, useable condition. It will be necessary to eliminate or greatly reduce such maintenance items as shoulder mowing, bridge rail and guard fence painting, and snow removal on recreational roads, and to reduce the maintenance of signs, center line traffic stripes, and other operating facilities.

The major maintenance problem is man power. There is an adequate budget and good equipment. It appears possible to get materials, but the maintenance personnel is being depleted by enlistments in the armed forces and by employment in logging, shipyards, and other war industries. Fifty women are working on field maintenance at present, performing such jobs as truck driving, flagging, and timekeeping. In spite of this difficulty, the Maintenance Department will do its best with what it has, to keep essential traffic rolling.

Missouri to Use Mudjacking Extensively

Rex M. Whitton, Missouri highway department engineer of maintenance, and C. W. Brown, chief engineer, report the following:

Our maintenance needs this spring on bituminous roads are definitely greater in the northern half of the state inasmuch as the spring breakup

(Continued on page 82)



Missouri Route 19 in Montgomery County. Left: where the Missouri River washed out 300 ft. of approach fill. Right: here used to be a seven-span bridge including a 120-ft. truss

Step-by-Step Photos of STREET JOB

By **GEORGE C. STANLEY**

City Engineer and Street Superintendent,
Burlington, Vermont



George C. Stanley

LATE in 1942 the city of Burlington decided to surface 2,000 ft. of an outlying residential and lake-resort street with soil-cement. The sandy soil was found to have excellent soil-cement characteristics. Trenches for sewers put in two years previously had settled, and it remained only to follow recommended procedure to obtain an excellent installation of this type of construction.

Combined curbs and gutters were placed some months before. As a preliminary to the soil-cement processing, the 23-ft. street surface along about 500 ft. of distance was skimmed down 6 to 8 in. to remove top material containing excess organic matter. Street level was then raised using sandy borrow material, so excavated as to complete the grading for a side street for future home development in the deal, top soil along graded street frontages being salvaged and put back.

A total of 5,835 sq. yd. of soil-cement was processed in three September days, using approved methods as high-lighted in the photos. Not pictured, but carefully applied, were standard field and laboratory control methods under direction of a trained soil-cement engineer. The work was done entirely by city forces, using equipment at hand. On page 00 are accompanying cost figures, based on established rental rates for the equipment employed, but not including a light surface treatment applied this spring following a winter of use.



4



1

Before

Staniford Road, in Burlington, Vt., as it looked at the start of curb construction



2

Curbs in

Organic top soil has been partly removed, preparatory to backfilling and raising grade with sandy borrow



3

Spotting Bags

First step in processing. Spacing of bags to provide definite per-sq.-yd. cement content was marked off near gutter (by man bending over). Bags at left already dumped on grade

Spreading Cement

Cement was spread uniformly over entire surface by spike-tooth harrows drawn by an Allis-Chalmers 1B tractor normally used for sidewalk snow removal. In foreground is header ending first day's work. Preparation of base for following day's work can be seen in distance

Continued on following spread →



Dry-Mixing

Cement was worked into the soil to a uniform depth of 6 in. using a Killifer Cultivator



Moisture Application

After thorough dry-mixing, precise amount of water for optimum density as determined by laboratory and field control was spread with the city's 600-gal. Kinney, Jr., asphalt distributor. Water was applied under maximum pressure, followed immediately with a Killifer spring-tooth cultivator and a 20-in. disc harrow



Discing

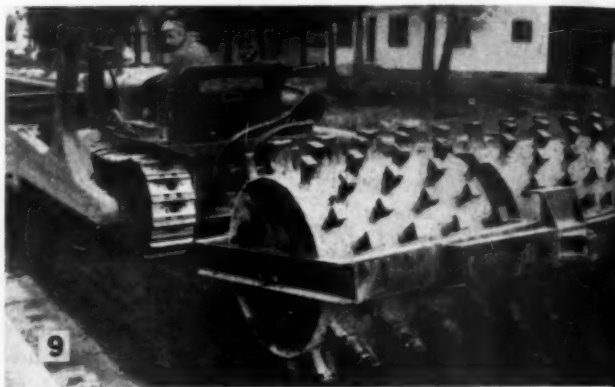
The mixing process continued after water application, using a double-disc harrow. A larger Allis-Chalmers tractor was obtained from the city borrow pit bulldozer job for this purpose

ROADS AND STREETS, June, 1943



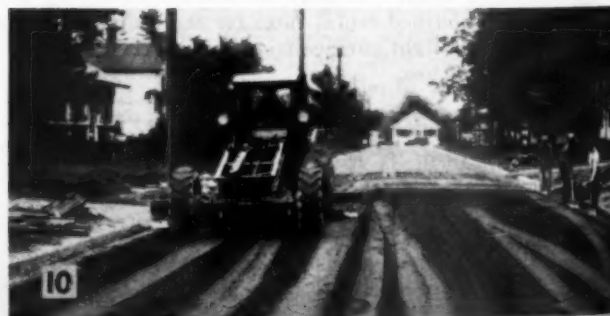
Edge Mixing

Next came an Austin-Western grader moving the edge mixture out from the concrete gutter slab to insure the return of thoroughly moist mixed soil-cement



Compacting

The familiar sheep's foot roller then came along to thoroughly compact the moist soil-cement mixture from bottom to top



Shaping

After roller had compacted all but a thin top mulch of material, the surface was bladed to final surface prepared for smooth-rolling. Note section in background completed previous day

Removing Header

(See photo 11)

These header boards marked the end of the first day's work. Planks at right are part of a platform used on second day for turning equipment around without damaging first day's work. Note sharp edge of day-old processed surface where header is being removed



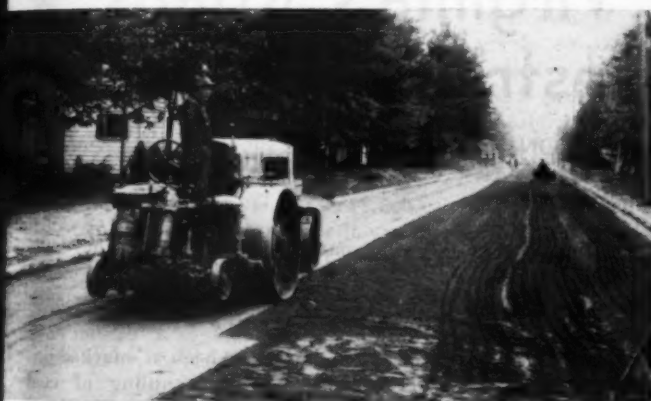
Manhole Frame

The manhole frame and cover shown in background of photo No. 11 were removed from top of manhole in center of street and a plank cover was placed below the surface to allow mixing, shaping, and rolling process to proceed over top of manhole without interruption. Exact location of manhole was preserved by marking face of curb on both sides, and measuring distance from center to center of manhole before removing casting. Next day, temporary plank cover was removed, casting reset flush with the surface of new pavement and hand mixed soil-cement was tamped around casting



Final Smoothing

A 2-ton tandem roller took care of the final ironing-out process. Left side of street, already rolled, is shown covered with sand for curing



Initial Surface

Surface rolling was done first with a 10-ton machine, using spike-tooth harrow to break up any separate-plane surface compaction that might have been created by passage of equipment before final grading



Sand Cover

A 3/4-in. cover of washed sand is here being applied to prevent moisture losses from the completed work. It was kept moist for one week by passages of the water-converted pressure distributor



About Done

Completed except for final going over with a light roller and surface sanding



Tack Coat

A month after completion the soil cement street was given a protective winter cover consisting of an asphalt-emulsion tack-coat, topped with washed sand (Later, Surface Treatment (not shown). This spring the street was broomed clean and built up with a 1/2 to 3/4-in. armor coat of emulsified asphalt and chips, followed by sand blotter and rolling.)



At work on a light surface seal—a secondary road in Kanawha County, West Virginia

Maintaining West Virginia's Roads Under War Restrictions

By E. L. WORTHINGTON

State Maintenance Engineer, State Road Commission of West Virginia

WEST Virginia's road system was hit hard during the past year by old man weather working in collaboration with the exigencies of war. He began his nefarious work in West Virginia during May of 1942 by increasing the tempo of precipitation, and there has not been a lengthy let-up since then.

Because of the consistent recurrence of precipitation, together with the fact that there was quite a delay last year in obtaining approval for the use of bituminous materials, our bituminous retreatment and surface seal program was interfered with to the extent that we had 141 miles of such work requiring approximately 700,000 gallons of bituminous material held over from last year, which must be added to this year's program.

Furthermore, the unusual amount of precipitation on the rugged terrain of West Virginia resulted in innumerable slides—many of them at points where the soil had been perfectly stable for years.

In addition to the slides, water tables were raised in many instances to the point where severe damage was done to bituminous surfaced non-rigid bases which had remained in good condition for years.

West Virginia has quite a mileage of untreated traffic-bound bases, which have been stabilized by applying creek or river gravel, crushed stone, chert, shale or red dog. Such traffic-bound stabilized surfaces depend largely upon a stable subgrade in order to carry the traffic loads. The presence of so much water in the soil caused subgrades to become unstable or yielding thereby failing to furnish adequate load-carrying support, with the result that many of our traffic-bound bases failed completely during the late winter and early spring. This means that we will be compelled to add additional stabilizing material to a large mileage of roads of this type.

More Heavy Hauling

Added to the damage resulting from an excess of water in the ground, there was, and is, a large amount of heavy hauling resulting from coal stripping operations. The high price of coal has made profitable this method of coal mining, and there are about 180 such strip-mining jobs in operation in the state. The hauling from these operations, under all weather conditions, has played havoc with many of our paved and stabilized road surfaces, particularly on the secondary system, which roads, for the

most part, were designed and built for farm-to-market roads, and could not be expected to hold up under such concentrated heavy hauling.

There has also been a marked increase in the truck-hauling of coal from small coal mining operations, locally known as wagon mines. The good price for coal has resulted in the opening of many such mines.

The step-up in coal mining has resulted in a corresponding increase in the number of mine props needed. These props are being cut on almost every hillside, and they must be hauled by trucks over the road system, and under all weather conditions, thus subjecting the roads to additional punishment.

Another road-damaging item is the hauling of logs and lumber. Saw mills have popped up like mushrooms in West Virginia during the past year and in addition to the denuding of many beautiful hillsides the roads leading to the markets are being damaged.

The oil and gas industry in West Virginia is vital to the war effort and in stepping up the scale of its operations much heavy hauling is involved adding to the road problem.

And then, on many of our more im-

portant through highways there is an increase in heavier traffic in the upper weight brackets, due to the hauling of war materials to and from our war industries, and through the state.

So taking all in all there is every indication that our maintenance problem has very materially increased this spring in comparison with last spring and other springs.

All roads in West Virginia, including county and local roads, are under the jurisdiction of the State Road Commission, and have been for the past 10 years. The total mileage in the State System is 33,011 miles, of which 28,234 is on the Secondary System, and 4,777 miles on the Primary System, and it might be interesting to note that 65% of the Primary System is bituminous-surfaced.

To correct some of the damage resulting from the unusually wet weather of the last year, together with the increase in heavy hauling; and also to protect the investment in the entire road system of the state, we plan to spend approximately \$7,500,000 during 1943 for all types of maintenance work. This amount is about 12% less than we spent during 1942, as the total for last year was about \$8,500,000.

\$2,000,000 Bituminous Retreatment

Out of the total expenditure for 1943, we plan to spend about \$2,000,000 for bituminous retreatment work, consisting for the most part of light seals and light surface treatments. We do plan to place a 3 in. penetration macadam surface on several projects, which have deteriorated to the



Front-end loaders, improvised from salvaged materials, are among the prime labor savers being used by the West Virginia state road commission. (See page 78)

extent that light treatments are no longer practical, but otherwise will confine our efforts to the lighter treatments in order to obtain a wider spread with our funds. This retreatment program will involve approximately 1,600 miles of road surface from 10 to 22 feet in width, and will require about 6,500,000 gal. of bituminous material. (Tar and asphalt on about a 50-50 basis.)

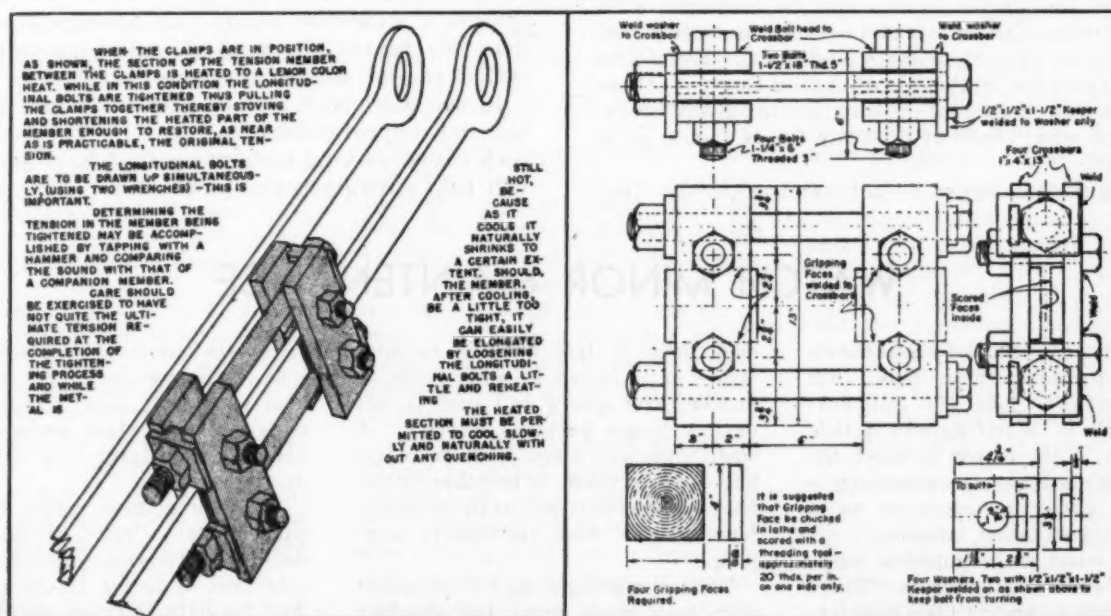
Another \$500,000 will be spent to restabilize unstable sections of traffic-bound roads, to complete unfinished stone base and traffic-bound surfaces started last year, and also to rebuild

about 25 small bridges. Approximately 200 miles of road will be involved in the stabilization, restabilization and stone base work.

To assist with the stabilizing of the traffic-bound surfaces, to alleviate the dust nuisance and to reduce the amount of blading and shaping, we contemplate the use of probably 1,000 tons of calcium chloride and will treat in the neighborhood of 60 miles of road.

The remaining \$5,000,000 will be allocated for routine maintenance work such as patching, spot sealing, ditch-

(Continued on Page 77)



Figs. 1 and 2. Details of bridge tension member tightener devised to equalize load on eye-bars of old bridges and thus prolong their usefulness. (See page 79)

Editorial

ONLY FREEWAYS WILL SOLVE BIG CITY CONGESTION

THE big news in Cleveland isn't just that plans are afoot for a post-war traffic relief program all the nation should be watching, but that *surveyors* are afoot.

Ohio has activated "advanced planning."

Under the able direction of the Ohio department of highways, sleeves are rolled up on the time-consuming task of fact-gathering, surveying and mapping, economic and traffic analysis, preliminary location studies, public hearings, and right-of-way acquisition.

Cleveland's experience points to several basic considerations:

First, is the importance of getting down to business *now*. After the war is too late to start such long-range effort, except for some remote future need.

Second, is the importance of setting up the planning job under an organization with sufficient jurisdiction and authority. In the Cleveland case, only the state

could muster the power to cut across local lines and do a real over-all regional job.

Third, is the importance of the engineering device known as the freeway or limited-access highway. Providing separation of traffic streams and insulation of express flow from local or cross-street flow, the freeway has emerged as perhaps the Number One working tool of the city planner. Certainly no metropolitan area can hope to hold its place in the post-war world without the traffic relief that only freeways can achieve.

And certainly motor transportation cannot hope to advance much farther until modern freeways are built into, through, and around America's centers of congestion.

Engineers know these facts. But the public, though congestion has been its daily fare, is only dimly aware of them. A big part of the job is public education.

FACTS WANTED ON IMPORTANCE OF LOCAL ROADS

MANTON HANNAH, county engineer down at Waco, Texas, hit something right on the button at the recent American Road Builders' meeting when he urged traffic counts on local roads. In some states, many officials feel, counties have gotten the short end of the deal on road funds. And county people naturally are concerned with getting a fair share of post-war funds.

It would be mighty smart for any county right now to make a few traffic counts and be prepared with figures showing the total travel over its secondary and local roads, as against primary and urban. Even with the data from the Statewide Planning Surveys, there has been a lack of factual information to satisfy everyone on just what share of highway funds should go to local roads.

The significant figure is not vehicles-per-day past

any given point; "counts" alone will seldom disprove the popular expression that "highways carry 90% of the traffic on 10% of the roads." Rather the need is to know the *vehicle-miles* of travel over the whole county and township system. With so many local roads, it doesn't take much traffic volume to count up in total highway use. For example, one county recently found that the average 7-day count on several of its typical roads was 128 vehicles per day (as against a statewide county-road average of far less than this figure). On a *vehicle-mile* basis this county system carries 45% of the rural traffic.

In the past, much money has been voted for local highway improvements on a general knowledge that such roads are vital to farming. Cold facts and figures will help strengthen this case.

WATCH MINOR MAINTENANCE

THERE are plenty of big maintenance problems these days. But don't forget *little jobs*! Not fully covered in E. L. Worthington's article (page 54), is the extent to which the West Virginia highway commission is stressing minor maintenance as a wartime conservation measure.

In the latest state employee bulletin Mr. Worthington observes: "There is a tendency to neglect little maintenance problems until they develop into big ones. For example, a small pave-

ment hole is left until it becomes larger or is joined by other holes. A knocked-over guard rail post is left until a larger problem develops. A small slide may block ditch drainage, but because there is less-than-truck-load involved it is left until the maintenance crew feels justified in stopping.

"Water running along the pavement edge may wash away the shoulder but because the trouble is of little magnitude it is passed up for the time

being. On numerous occasions I have seen maintenance crews ride right past such little jobs in order to get to larger ones which probably would not have been large jobs if corrected in the beginning."

Mr. Worthington makes two good suggestions: Crews on the way to definite destinations should stop and take care of minor troubles enroute. And specialized crews shouldn't disdain these miscellaneous jobs but should be alert for them.

Michigan Practice in Gravel Stabilization

The Michigan highway department is continuing with a considerable stabilization program, as a means of preserving gravel surfaces with minimum wartime effort

By B. R. DOWNEY

Maintenance Engineer, Michigan State Highway Department, Lansing

STABILIZATION of gravel state roads by the "mix in place" process in Michigan is accomplished by using either sodium chloride or calcium chloride for the chemical admixture. Our practice is to complete this work prior to August 1st—authorization must be secured for emergency stabilization work to be done later.

The following tentative instructions govern this work in Michigan:

PRELIMINARY PROCEDURE:

The preliminary procedure is the same, whether using sodium chloride or calcium chloride. All loose material on the road surface should be bladed into the shoulder of the road and windrowed. If needed, additional gravel ($\frac{3}{4}$ -in.-max.) should be added to the windrow at this time. Stabilization should be effected to a depth of at least $2\frac{1}{2}$ in. from the finished surface and not over 4 in. in depth. Stabilization to this depth may be accomplished by scarifying the existing gravel surface or adding gravel.

Uniform stabilization procedure includes, among others, the following operations: (1) station marking the road; (2) mixing windrow material; (3) measurement of windrow material; (4) sampling of windrow material; (5) mechanical analysis of windrow material; and (6) design of mix (determination of source and quantity of binder soil). Operations (3) and (4) are performed at the same time.

(1) Station Marking the Road

Marker stakes (1" x 3" x 2') should be colored by dipping in maintenance paint. The color of the stakes should agree with the color scheme shown on the soil survey map (which has been prepared by the Soils Engineer) as follows: (1) yellow for sand; (2) orange for loam; (3) red for clay; (4) white for swamp or muck areas. The station numbers should be burned into the stakes prior to painting.

The properly identified stakes should be located on the right-of-way at $\frac{1}{2}$ mile intervals. A suggested



An excellent stabilized gravel road in Michigan, showing proper crown and absence of water-retaining chuck holes.

position is near the property fence line. The stakes should be numbered consecutively from the P.O.B. (point of beginning) of gravel sections within a county.

A delineator or guide stake made from 2-in. saplings may be placed as an aid in locating the station stake.

Permanent marker stakes are not necessary for shoulder stabilization.

(2) Mixing Windrow Material

The existing surface material which has been bladed into the shoulders and new gravel which may have been added to the surface material should be bladed in from the outside edge of the shoulder, up to the edge of the traveled roadway, by the use of an underbody blade attachment. It is desirable that none of the mixture be bladed onto the traveled portion of the roadway.

The material should then be windrowed by reblading toward the outside edge of the shoulder by the use of an underbody blade truck equipped with a full cutting edge. If the windrow material is too heavy to be handled by an underbody blade attachment, power graders or drawn-type graders should be used.

(3) Measurement of Windrow Material

The quantity of windrow material will be determined by a selected maintenance employee under the guidance of the District Soils Engineer. To compute this volume, two operations are necessary: measurement and computation of the end area (generally at the $\frac{1}{2}$ -mile stations, or oftener) and computation of the volume.

Measurement and Computation of End Area

In order to compute the end area, the windrow material should be fashioned into a trapezoidal shape (See Fig. 1, page 58) with a square point shovel at the point of measurement and the following dimensions taken to nearest 0.1 ft.

- A = width of top in ft.
- B = width of base in ft.
- H = height of windrow in ft.

The end area (E) is determined by the formula $E = \frac{A + B}{2} \times H$.

Example: A windrow measures 0.8 ft. across the top, has a base of 1.6 ft. and a height of 0.4 ft.

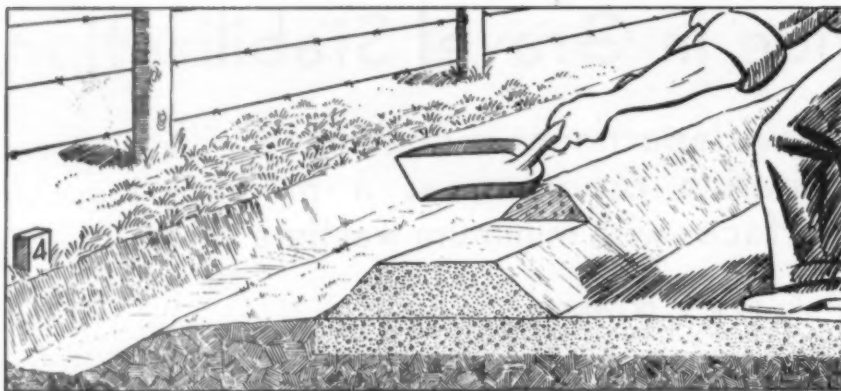


Fig. 1. Placement of station markers and shaping of windrows.

$$\text{Then: } E = \frac{0.8 + 1.6}{2} \times 0.4 = 0.48 \text{ sq. ft.}$$

After the end areas have been measured the average end area between stations is determined as follows:

Let E_1 = end areas at Sta. 1.
Let E_2 = end areas at Sta. 2.

$$\text{Then the average end area between Sta. 1 and Sta. 2} = \frac{E_1 + E_2}{2}$$

Example: The end area at Sta. 1 is 0.48 sq. ft. and the end area at Sta. 2 is 1.32 sq. ft.

$$\text{Then: Average end area} = \frac{0.48 + 1.32}{2} = 0.90 \text{ sq. ft.}$$

Computation of Volume

To determine the quantity of material in the windrow the following formula will apply:

Vol. in cu. yds. per $\frac{1}{2}$ mile of windrow = $E \times 97.8$.

Where E = average end area
97.8 = cu. yd. per $\frac{1}{2}$ mile per sq. ft. average end area.

Example: A $\frac{1}{2}$ mile section of windrow has an average end area of 0.48 sq. ft.

Vol. = $0.48 \times 97.8 = 46.944$ or 47 cu. yd.

(4) Sampling of Windrow Material

The sampling will be done by a selected maintenance employee under the guidance of the District Soils Engineer. Samples should be selected from the windrow material prior to the application of binder soil or other blending material.

A composite sample for each $\frac{1}{2}$ -

mile section should be taken in the following manner:

Remove a complete section of approximately 2 cu. ft. (200 lbs.) of material from the windrow at the point where windrow measurements are made (generally at each $\frac{1}{2}$ mile station). Place this material on a flat surface (preferably a wooden platform covered with galvanized sheet metal about 4 ft. square), and quarter it in the following manner:

Thoroughly mix the material with a trowel or shovel and form into a conical pile. The cone should then be flattened into a cake about 4 in. by pressing vertically downward on its apex. This cake should be quartered by cutting into 4 equal parts. Discard 2 diagonally opposite quarters. Remix the material and repeat the above operations until the final quarters weigh about 12.5 lb. each. The final quarters should be combined as shown in Fig. 2.

When the final quartering of the initial station sample is completed, place two opposite quarters (about 25 lb.) in sampling bag. Proceed to final quartering of Station 1 sample.

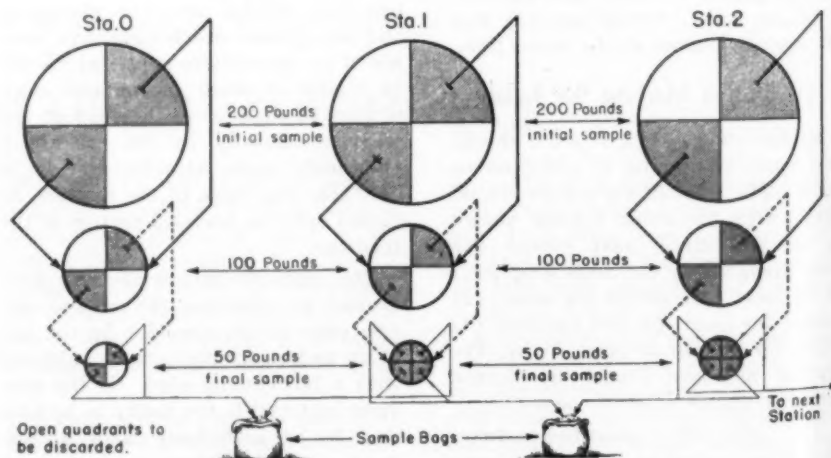


Fig. 2. Method of quartering and combining samples.

Combine two opposite quarters of sample from Station No. 1 (about 25 lb.) with Station No. 0 sample and properly identify sample bag by filling out and placing in the bag a Gravel Sample Identification sheet.

Place remaining two quarters from Station 1 in an empty sample bag. Proceed to Station 2. Complete operation as described above for composite sample for Station 1 and 2, etc.

Take composite samples (about 50 lb. each) to maintenance garage for mechanical analysis.

(5) Mechanical Analysis of Windrow Material

The mechanical analysis will be made by the District Soils Engineer, having for his assistant a selected maintenance employee. The composite samples should be quartered and the quarters not used for test samples should be replaced in sample bags with identification and stored until further notice.

(6) Design of Mix (Determination of Source and Quantity of Binder Soil)

The mixture will be designed by the District Soils Engineer in accordance with the following requirements: In general, the stabilized mix shall be designed for plasticity index of 5 over a clay base, 6 over a loam or muck base, and 7 over a sand base. However, only 65-70% of the clay so computed shall be added to the windrow material. If the material passing the No. 200 sieve in the computed mix, using 65-70% of the computed material, is in excess of the limits shown in the table below, redesign the mix, using a lower plasticity index which satisfies the table. If the material passing No. 200 sieve in the computed mix, using 65-70% of the computed material, is less than the limits shown

in the table, additional binder soil should be added until the minimum requirement of the table is reached.

P. I. Range of Binder Soils	Passing No. 200 Sieve
10-16	9½-12½%
16-25	8 -10½%
Above 25	7 - 8½%

FINAL PROCEDURE, SODIUM CHLORIDE

After the binder soil has been added to the windrow, it should be allowed to dry thoroughly and then pulverize as completely as possible by the use of a gravel compactor, if available, or other suitable means. Then apply an admixture of sodium chloride to the windrow at the rate of 6 lb. per cu. yd., which amounts to 1 ton per mile in. of depth of proposed stabilization.

The binder soil and the sodium chloride should be thoroughly mixed into the windrow material by blading the material up to the edge of the traveled roadway with an underbody blade truck having a cutting edge only on the right half section of the underbody blade attachment.

The material should then be bladed toward the outer edge of the shoulder by the use of an underbody blade attachment having in place both cutting edges. Blading operations should continue until the material is thoroughly mixed. (If the windrow material is too heavy to be handled by an underbody blade attachment, power graders or drawn graders should be used).

This mixed material should be bladed back onto the road in ½ to 1 in. layers. These layers should be taken alternately from the right and left windrows. This should be done with a power grader followed by a blade truck distributing the material across the full traveled road width. Continuous wetting of the material during this operation is essential to good compaction. Care should be used in applying water in order that the material will not become sloppy.

After all material from the windrow has been replaced on the roadway, blading operations should be carried out.

The crown should be built up slightly higher than 5 in. for a 20-ft. roadway to allow for compaction.

Final smoothing should be followed as soon as necessary by an application of calcium chloride, 2 tons per mile, to lay dust.

FINAL PROCEDURE, CALCIUM CHLORIDE

The binder soil should be added and thoroughly mixed, the process

being essentially the same as for sodium chloride except that calcium chloride should be spread 2 tons per mile (20 ft. roadway) after all windrow material has been replaced. It should be thoroughly worked into the

top of the metal to a depth of 1 to 2 inches by the use of a multiple blade maintainer. Then final blading operations should be carried out. Final smoothing should be followed by a calcium chloride dust layer.

More "Pix" from the Recent ARBA Annual Meeting

These informal scenes were snapped at the party given by Bill Parrish of International Harvester Co. for Sam



ARBA president-elect Carl W. Brown, chief engineer Missouri highway department, "in conference" with Neal Higgins, sales manager of International Harvester Co.



Bob Cummings, equipment supt. of Missouri highway department (right) chatting with L. W. Dingley of Int. Harvester; H. R. Meeker, gen'l manager of J. D. Adams; and H. N. Ross, Harvester's southwestern dist. manager



Dramatic moment of the party—Bill Parrish of International Harvester presenting Sam Beatty with a miniature manure spreader for his farm

F. Beatty, president, Austin-Western Road Machinery Co., who is retiring president of Highway Industries Association, affiliated with the Manufacturer's Div. of American Road Builders Association.



E. H. Cooper, southwestern manager of Barber-Greene Co.



Sales manager R. K. Stiles of Austin-Western



Close harmony: Singing lustily here are Hal G. Sours, Ohio director of highways; Tom Cutler, Kentucky chief engineer (back turned); A. L. Cutler, of Highway Steel Products Co.; Vice-president Brunsdale of Pioneer Engineering Works; Lion Gardner, Jaeger Machine Co.; Sam Beatty and others well known to road builders



Capt. T. W. Clark, expeditor of crawler tractors, Corps of Engineers, and J. Ellertson, asst. secy., Pioneer Engineering Works

State Highway Debt Requirements Exceed \$2,433,000,000

Combined state highway obligations for 39 states having state highway debt January 1, 1943, totaled \$2,433,901,213, according to "reasonably complete" figures compiled by the Public Roads Administration.

New York's \$477,927,709 state highway debt is the largest and Idaho is the least encumbered with a state highway debt of \$289,834.

Under current schedules reported by PRA, Michigan will be free of state highway debt in 1944 while New York's debt service requirements will run until 1987.

Reported free of state highway debt are: Arizona, Indiana, Nebraska, Nevada, Oklahoma, South Dakota and Utah.

The tables on the following pages show total principal and interest obligations on state highway debt for each state and the annual debt service requirements. Obligations include such items as state highway and bridge bonds, state issues for reimbursement to local units of government, state issues for local roads, highway refunding bonds and sinking fund contributions.

Highway debt by states and the year of final programmed retirement are given herein:

Alabama	\$ 50,649,713 (1962)
Arkansas	212,250,715 (1972)
California	227,873,890 (1976)
Colorado	24,607,947 (1954)
Connecticut	24,003,510 (1971)
Delaware	10,343,729 (1979)
Florida	2,988,490 (1970)
Georgia	16,672,473 (1948)
Idaho	289,834 (1946)
Illinois	144,220,000 (1959)
Iowa	61,776,565 (1950)
Kansas	17,175,392 (1958)
Kentucky	4,056,266 (1959)
Louisiana	145,375,659 (1962)
Maine	27,327,108 (1978)
Maryland	22,251,153 (1961)
Massachusetts ...	5,670,271 (1956)
Michigan	30,114,120 (1944)
Minnesota	33,116,450 (1952)
Mississippi	71,128,601 (1964)
Missouri	101,455,025 (1957)
Montana	5,939,471 (1949)
New Hampshire..	10,221,228 (1954)
New Jersey.....	119,372,261 (1974)
New Mexico.....	24,890,405 (1957)
New York	477,927,709 ^a (1987)
North Carolina...	97,872,057 (1964)
North Dakota....	634,600 (1954)
Oregon	12,309,535 (1960)
Pennsylvania ...	183,162,201 (1968)
Rhode Island.....	11,692,617 (1977)

South Carolina...	70,122,344 (1960)
Tennessee	66,625,670 (1958)
Vermont	4,213,587 (1956)
Virginia	3,980,010 (1947)
Washington	8,853,455 ^b (1956)
West Virginia....	89,732,762 (1966)
Wisconsin	10,180,190 (1950)
Wyoming	2,824,200 (1953)

^aInformation on reimbursement obligations assumed by the state of Florida, state issues for toll bridges in Ohio and reimbursement obligations assumed by the state of Texas was not received in time for inclusion in the PRA tabulations. Missing information from Ohio and Texas increases to 41 the number of state governments in debt for highways.

^bEstimated amounts which will be required to cover both interest and principal payments.

^cBonds actually mature in 1960. Amounts recorded are based on optional schedule of retirements.

Corps of Engineers Seeks Construction Recruits

Photo taken at dinner sponsored by the Construction Industry of metropolitan New York, June 3, to aid in the recruiting of 100,000 construction men for the Corps of Engineers. 1,500 representatives of allied construction trade associations heard Major General Eugene Reybold, Chief of Engineers, U. S. Army and Brigadier General B. C. Dunn, Division Engineer, North Atlantic Division, report on the accomplishments of the Army Engineers in their world-wide construction program.

Said General Reybold, "the scene is shifting from areas of preparation here at home to the actual theaters of war where there lies ahead a tremendous task for construction workers. Most of the construction activities and responsibilities are being

transferred to foreign shores, and most of the work, of necessity, must be done with troop units whose skilled workers and officers are drawn in large numbers from the ranks of the construction industry."

In calling for the voluntary induction of skilled construction men, General Reybold said, "this is a challenge to the men who want to help engineer the forthcoming victory. Airdromes must be built all over the world, streams bridged to bear the advancing arms and armies of Democracy, roads constructed, water facilities provided, storage and repair depots raised and harbors deepened, minefields and entanglements cleared for the advance of our troops, obstacles set in the path of the enemy—a thousand jobs that call for the type of specialists who have been employed in the construction industry."

The sponsors of this industry-wide dinner included: Associated Equipment Distributors; Building Trades Employers' Association; General Contractors' Association of N. Y.; Metropolitan Builders' Association; New York Building Congress, Inc.; Public Building Contractors' Association of New York.



At the American Road Builders recent annual meeting in Chicago: Capt. L. N. Moeller, Director Progress Control, Navy Bureau of Yards and Docks; A. E. O'Brien, Exec. Secretary, Associated Pennsylvania Contractors; and Col. E. R. Needles, Chief, Construction Control Office, Corps of Engineers



Left to right: J. W. Escher, White Construction Co., Dinner Committee; Dr. J. J. Klein, Chairman, Renegotiation Board, North Atlantic Division; Colonel C. M. Boesch, Executive Assistant, North Atlantic Division; Major General Eugene Reybold, Chief of Engineers, U. S. Army; J. P. H. Perry, Turner Construction Co., Chairman, Dinner Committee; Brig. General B. C. Dunn, Division Engineer, North Atlantic Division



Somewhere south of the equator a sturdy 1-ton Mack does ground duty for one of Pan American Airways' famous flying clippers. ' Sketches by Peter Helck.

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You don't have to work long with trucks—either as owner or driver—to see why the admiring phrase, "Built like a Mack truck" has established itself in America's language. On the heavy punishing jobs it has been known for years that a Mack's your *best* truck in the end because it's *more* truck to begin with. The performance of little Mack pick-up and delivery trucks in wartime transportation is proving that every Mack, no matter what size, is truly a chip off the old block.



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IF YOU'VE GOT A MACK, YOU'RE LUCKY...IF YOU PLAN TO GET ONE, YOU'RE WISE!

ROADS AND STREETS, June, 1943



Cutting slope back for new widened roadway.

Stage Construction on County Access Relief Highway

NOT all access roads need to be super-highways. Sangamon County, Illinois, is grading and graveling 15½ miles this year as stage-construction between Springfield and an outlying ordnance plant. The partly completed road recently carried over a million tons of gravel for ordnance plant building construction. Started by WPA, this route will relieve State route 36. The old cross-section is being widened to 30 ft. shoulder to shoulder, and 6 in. of gravel put down 23 ft. wide. During early summer after compaction by

traffic, aided by sheepsfoot rollers, a ¾-in. penetration of light asphalt is to be placed, followed by a seal coat with buckshot gravel. 196,000 gal. of asphalt has been approved.

Two miles of stabilized gravel on another section will be treated with calcium chloride instead of asphalt. While new concrete and corrugated pipe culverts are being placed, the replacement of several old narrow bridges is deferred until "later." Ray V. Tilly is County Superintendent of Highways.

House Passes Postwar Planning Bill

By a voice vote, according to A. R. B. A. report from Washington, the House passed H. R. 2798, making federal-aid funds available for postwar planning and amending existing law so as to include rights-of-way as part of the cost of construction. The bill is a substitute for H. R. 2113, on which the Roads Committee recently held extensive hearings. The House approved the bill in the same form as reported by the Roads Committee on May 27. The measure provides for:

1. The inclusion of costs of rights-of-way as "construction costs."
2. The non-lapsing of federal-aid funds due to their unobligated status.
3. A maximum of \$50,000,000 of federal funds for advance planning to

be matched by the states on a 50-50 basis.

4. An increase in the amount of funds available for access roads to sources of raw material from \$10,000,000 to \$25,000,000.

5. The Commissioner of Public Roads to make a survey of the need for a system of express highways.

Measure Called "Most Important"

In the absence of Chairman Robinson, Congressman Whittington of Mississippi did a splendid job in managing the bill on the floor of the House for the majority, while Congressman Wolcott of Michigan, ranking minority member, took the leadership on the other side of the aisle.

Speaking in support of the bill were Congressmen Randolph of West Virginia, Elliott of California, Cunningham of Iowa and Mott of Oregon, members of the House Roads Committee. In addition, Congressman Stefan of Nebraska, former member of the House Roads Committee and now a member of the Appropriations Committee, forcefully urged approval of the bill. Stressing the importance of the measure to the future of the highway program, the proponents of the bill emphasized the necessity of its immediate enactment to prevent the reversion of monies now available to the state highway departments; and the essentiality of the proposed law to the proper preparation of plans for postwar highway construction.

Referring to the recent A. R. B. A. meeting in Chicago, Congressman Stefan commended the Association on its leadership and studies in connection with postwar highway construction and added that the bill before the House was the most important piece of legislation ever written by the Roads Committee.

Early Senate Action Expected

The bill must go to the Senate where prompt action is necessary in order to prevent the lapsing of a substantial amount of unobligated federal-aid funds at the end of the month. Unless the bill becomes law before June 30, approximately \$69,000,000 of federal-aid funds will expire. In spite of an extremely heavy calendar, the Senate, nevertheless, is expected to act in sufficient time.

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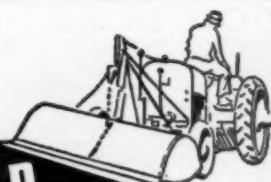
ROADS AND STREETS, June, 1943

WOOD GOES TO WAR

An MGM Technicolor short by James A. Fitzpatrick.

Ask your theater when you can see it.

THE PIONEER STILL LEADS THE FIELD



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Contractors and engineers engaged in military construction are urged to get all the facts on this improved 1943 job-tested ROTOTILLER Roadmaker. Write for literature.

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ROADS AND STREETS, June, 1943

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Equipment Maintenance

Salvage! Is the Word in Ohio Div. 7 Shop

By H. J. McKEEVER

Associate Editor, Roads and Streets

A FULL-FLEDGED battery salvage department, rebuilding three hundred batteries a year;

A continuous succession of welding and other salvaging and emergency repair jobs on its road equipment;

Four major shop equipment units and several lesser shop-floor items, rigged up Rube Goldberg fashion from old parts dating back to Dere Mabel days;

A large storage building erected with used paving brick and second-hand timber roof trusses;

Four snow plows made out of whole cloth from salvaged materials;

Forty truck-plows adapted with under-frame connections for heavier duty, again with old iron and parts;

Numerous small and not-so-small bridges, designed from the steel of wrecked spans;

A "duration" footbridge at Sidney, 100% old timbers;

These are the notebook entries from



R. E. Teegarden, Division Engineer, Ohio Department of Highways, Sidney, O.

a brief visit to Ohio State Highway Department's Division 7 headquarters and shop at Sidney, Ohio. Reports indicate that similar salvage efforts, dependent on local conditions

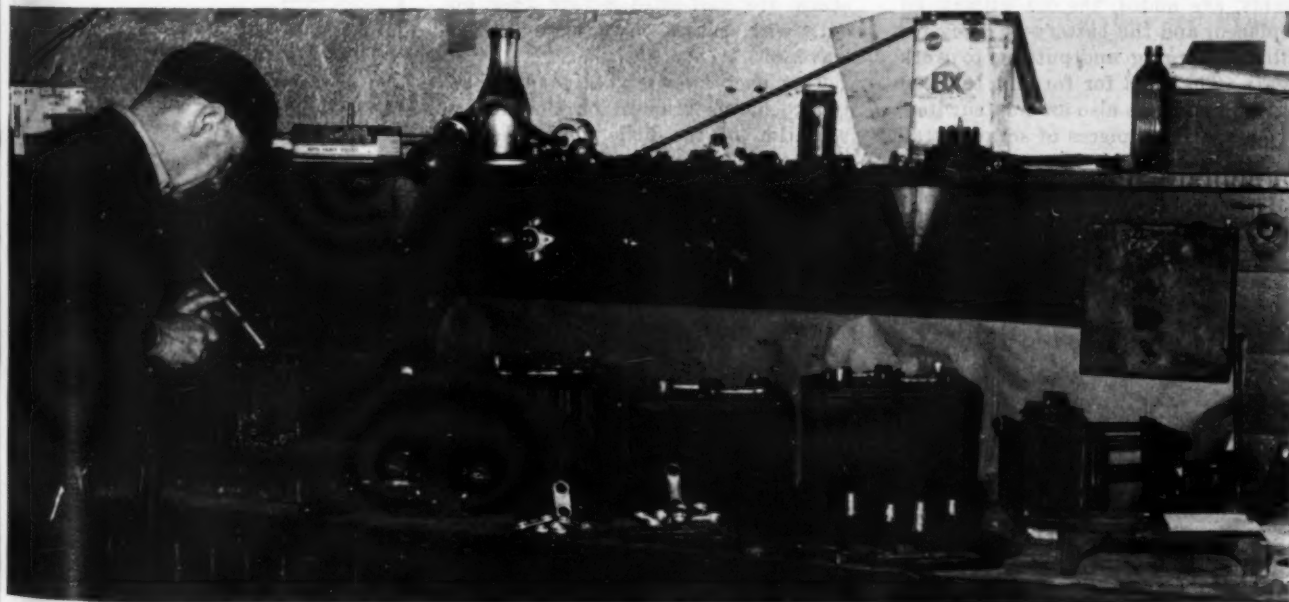
of need in each division of the state, are being carried on, and if so, the Ohio effort is worthy of study by other highway people, and incidentally of passing notice by certain folks in Washington.

The snow plow and bridge items will be described in later articles, but here are a few details on the battery repairs, welding work and home-made shop equipment.

Battery Salvage Methods

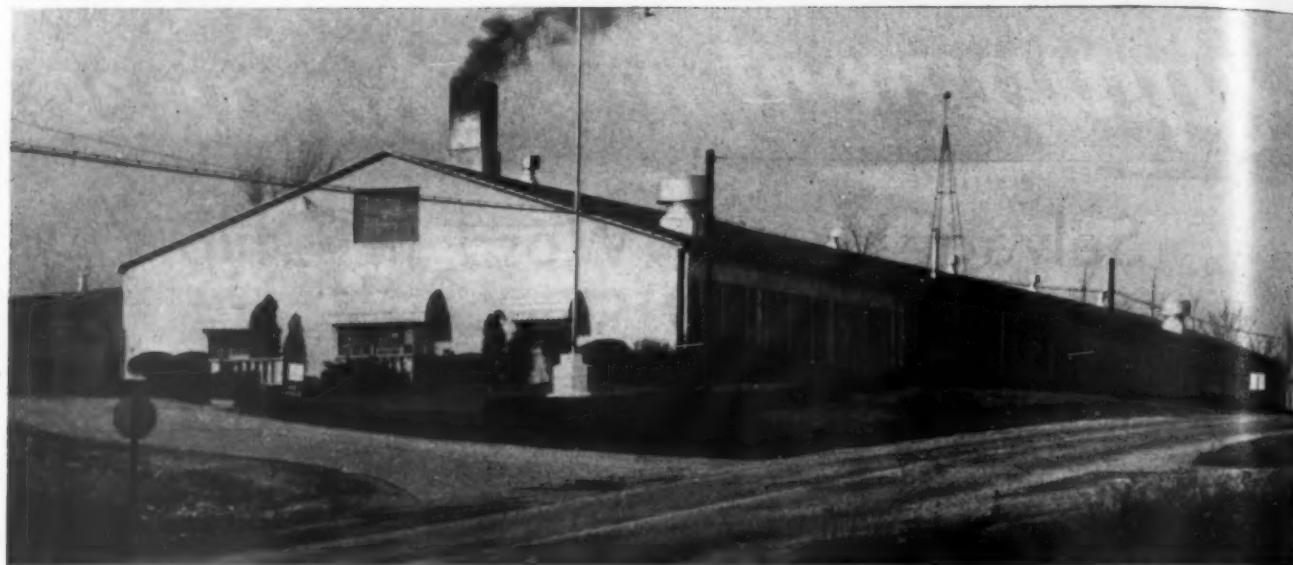
Battery rebuilding is done in a closed-off room equipped for acetylene welding, soldering, lead casting, and battery charging and testing.

The old battery "innards" are first removed and inspected. Often it is found that the negative plates are still in serviceable condition, since they deteriorate less rapidly than the positive. If these are worth re-using, the worn-out positive plates are cut away from the plate gang, and a new connecting plate and stand (post) are



War-time battery rebuilding. Harry Ricks, battery repairman building up a plate gang on a home-made rack. He is soldering post stand to plates. To right of rack (back) are three over-hauled batteries. In foreground are home-made moulds and varying sized straps, posts, and bars made in the moulds. To right of batteries is the home-made plate press with re-built cell in press. In front of plate press is home-made separator trimmer which operates much the same as a paper cutter.

ROADS AND STREETS, June, 1943



Spacious, modern division headquarters at Sidney.

soldered on, together with replacement plates.

More often it will be found necessary to put in an entire new plate gang. In this case new stock plates are accurately lined up and held in position in a metal rack of special design. Once they are assembled, the man at the bench solders on an entire new connecting plate, including top plate and "crowfoot" or notched piece separating the plates. Sometimes this item is salvaged from the old plates.

Then new posts are soldered on. Posts are cast in the shop using salvaged lead and a factory-made mold.

New straps and bars, cast in shop-molds, are added, the old battery lid replaced, and the battery is ready for filling, charging and putting to work again. The mold for forming the lead burning sticks is also an amateur item machined from pieces of scrap metal.

Welders Can Salvage "Anything"

Before the war the Sidney shop welders tackled any repair job that would save money. Now they tackle any job . . . *period*. Among the welding jobs in the shop on this particular March day was an automobile clutch throw-out gear which was being bronze-welded back to original thickness; a cracked tractor cylinder head, welded across the top; an auto starter with a broken gear welded; a carburetor whose tiny governor arm had been welded securely back in place.

Welders also help reinforce new equipment parts for longer wear. As an example, new mowing machine shoes are half-soled before they go out, with pieces of broken spring leaves.

This shop knows what to do when truck chassis frames buckle. As a variation of the little kink used up

on Alcan Highway last summer, short lengths of $\frac{5}{8}$ -in. round reinforcing rod are welded over the outside or inside (or both) of the channels to splice and strengthen the break. (Fig. 1.)

An old rattler of a clam bucket came out of an overhaul nearly "new"

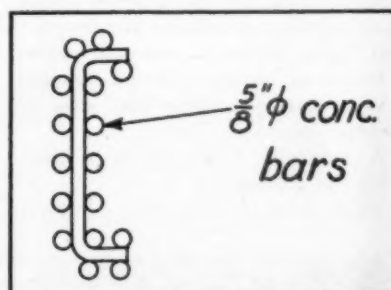


Fig. 1. How Ohio shop men at Sidney splice a broken truck frame—using pieces of $\frac{5}{8}$ -in. reinforcing steel

largely as a result of welding—teeth built up and hardened, of course, and loosened rivets replaced by welding all riveted parts together.

Complicated Machinery from Scrap Materials

Aladdin would rub his eyes at the tangle of gears, shafts and pulleys dovetailed together into useful shop equipment here. Begun by Chief Mechanic Paul Boyer, now a captain in Army Ordnance, and carried on by present Chief Mechanic Jesse Zook, Shop Foreman Minor Howe, Machinist Jess Rudy and others, this shop's "war babies" include the following useful items which cannot be bought from any factory at the moment.



Overhaul time in the Sidney, Ohio, state highway shop



Welding is a wholesale operation. Frank Harsh, welder is working on the end of a power take-off from a Fordson tractor. In the middle of this take-off you can see where a broken out portion has been filled in by welding. To the left of take-off is a water pump with welded crack. In the background is a welded cylinder head. In the foreground, left to right, are a large mowing machine shoe which has been reinforced, a cement mixer arm lift to be welded, a broken belt pulley in for welding, and a hose coupling from a tar distributor on which a new tightening ear has been welded

Punch Press, Strange to Behold

An efficient and very busy punch press was devised from the floor up. Its gearing is from a 10-ton Caterpillar. Its flywheel, from a Liberty truck, vintage 1918. Bearings incorporate used bronze bushings, taken from tractors and other units and cut down to fit. The clutch is shop-made, from stock metal. Two shafts, likewise, use stock metal. Framing is with salvaged bridge I's.

This unit is especially designed to stamp out, complete in one operation,

thousands of strap-metal bridge floor clips, used in deck repairs.

Pipe Threading Machine—A Prize Job

Still more complicated, and filling an equally vital place in the shop, is a threading machine which handles bolts from 5/16 to 1 1/4 in. diam. The gearing is from a Liberty truck. Structural parts, again from old bridge members. The oil tank is from a Liberty engine. The oil pump is out of a Chevy truck, and so is the 4-speed transmission. Even the auto-



Neat welding job—bottom pan of McCormick-Deering tractor. Base coat steel rod used



Sixty lineal inches of welding salvaged these Holt tractor motor blocks, which had frozen and burst. (Right) Portable acetylene welding cart made of salvaged materials. The rear wheels are from a Model T Ford. The front wheel is from a worn-out sand spreader. The front wheel bracket was cut from a solid piece of scrap iron. The entire cart is made from salvage material



Believe it or not, a punch press and an efficient one
—see article

"Rube Goldberg" Shop Equipment at Sidney, O.

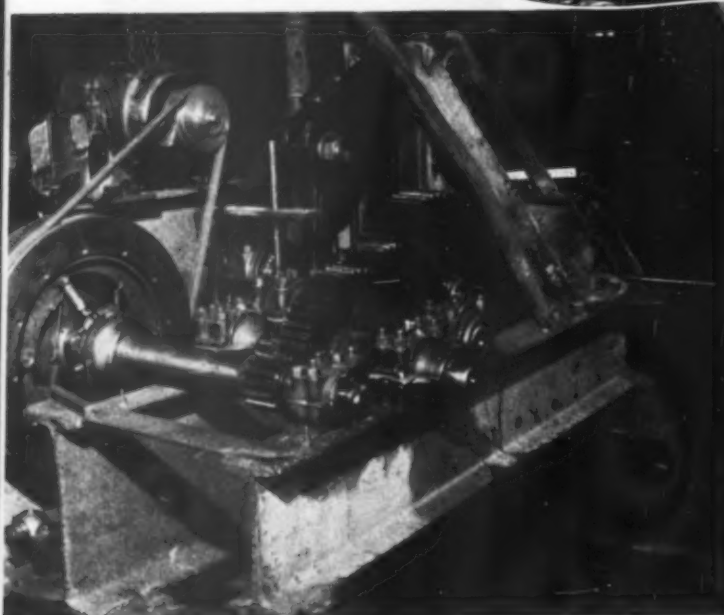


Much needed pipe threading machine
"duration" job made from old parts



Center: At Sidney, Ohio, state shop: Rudy, machinist; Minor Howe, foreman; Jesse Zook, chief division mechanic

Front and rear view of ingenious shearing machine made from salvage items throughout



matic feed stop was manufactured by the shop men, using small pipe for handles. The only "store boughten" parts are the threading dies and the chuck, although the die holding bracket is home-made.

Sturdy Shearing Machine
"We tried a $\frac{3}{4}$ x 3 inch piece of steel on her and nothing broke," said Machinist Rudy, in telling of the probable "rated" strength of their shop-manufactured shears. It consists of

a gear train from an ancient Holt tractor, bearing caps from a still older Liberty truck, flywheel out of Kelly-Springfield truck, home-made flywheel brake drum mechanism and clutch using the brake shoes from an

auto. A connecting rod and one section of a crankshaft out of a ten-ton Caterpillar are part of the job, as are shearing blades fashioned from worn-out scraper blades. The 220-v., 2-phase, 1-h.p. motor is of course factory made. The bearings, to round out the picture, utilize salvaged bab-bit.

Other Items

A horizontal ram-operate bar bending machine is Exhibit "A" in the blacksmith room. Made by the mechanics from scrap bridge iron and a salvaged ram unit, it is used for bending operations in the manufacture of snow plow shoes, U-bolts, and many other items. Several home-made dies have been provided.

And a much-needed portable cart for an acetylene outfit was assembled from "thin air." Two hard-rubber tired wheels from a Model T Ford serve as rear wheels. A small wheel off of a sand spreader does duty in front, fitted into a bracket cut from a solid piece of scrap steel. The whole car is a salvage-metal job.

"Conservation of Construction Equipment and Facilities"

This 80-page book has been published by the Associated General Contractors of America, Inc., as an aid in the war effort. Its purpose is to help conserve critical materials and maintenance of equipment now impossible to replace. Of convenient pocket size, the book is designed for use by key men directly responsible for the operation and maintenance of equipment and critical materials.

A chapter on Plan Layout presents suggestions for laying out a construction project so as to conserve manpower and economize on critical materials. A section on Construction Equipment presents basic principles governing use, care and repair of equipment. Separate chapters are devoted to internal combustion engines, electric equipment, automobiles and trucks, small tools, rubber, wire rope and manila and hemp rope, tarpaulins and canvas, scaffolding, steel piling and forms. Forty-three items of equipment are listed in a "Glossary of Maintenance Hints." A chapter is also devoted to salvage and reclamation.

A reference list is included, giving the names of manufacturers of various kinds of equipment, from whom further literature and suggestions may be secured in connection with maintenance of their equipment.

Copies may be secured from the Construction Foundation, Munsey Building, Washington, D. C., at 50 cents each, \$5.00 per dozen and \$25.00 per hundred.

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Equipment Production Speeded by WPB

Manufacture of construction equipment is being pushed ahead as a result of efforts by WPB's Construction Machinery and Equipment Division, which has set up a section for that purpose.

The report shows that 165 requests for assistance in obtaining necessary material have been received by the section from various manufacturers within the past five weeks. In all cases the section has either expedited the orders for critical material or made surveys for the applicants on the situations of their purchase orders for such material.

The section's researches enable manufacturers to anticipate and often eliminate bottlenecks before they become acute. It also assists manufacturers in obtaining steel plate and alloy; in setting up yearly bearing and engine requirements, and in finding suppliers for a number of manufacturers who are unable to place their purchase orders.

The requests contain from one to fifty items, the average being about five. Approximately two to four working hours are spent by the expediting section in locating sources of supply for a particular item and in notifying the manufacturer of the location of the available item.

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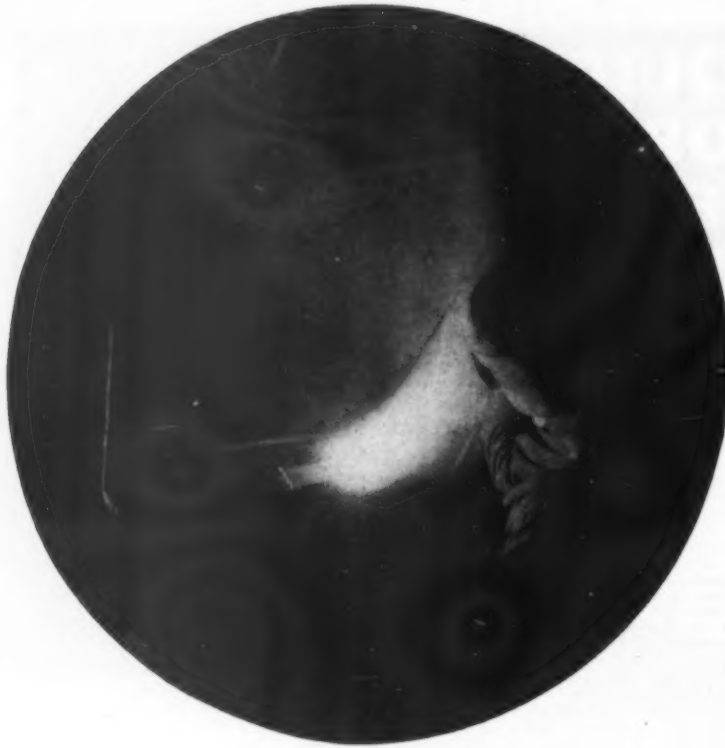


FIG. 1

A CLAMSHELL bucket is the business end, or the tool, that controls the performance, efficiency, and yield on the whole crane and bucket investment. Therefore, it is important to preserve sharp teeth and cutting edges of the lips because blunt lips or teeth offer objectionable resistance to penetration and reduce the bucket's efficiency.

Since the very nature of clamshell bucket work subjects the teeth and cutting edges of the lips to severe abrasion, repair work by competent experienced men is essential.

Worn Bucket Lips—Methods of Renewing Cutting Edges

When excessive lip wear occurs, causing objectionable resistance to penetration, or leakage or shifting through of the fine material, particularly at the scoop corners, the cutting

edges of the lips may be renewed by the application of electric weld, using a hard-surfacing electrode, readily available on the market. If the four corners of the lips are built up on the inside at the first appearance of wear, for a distance of 6 or 8 inches from the corners, uniformity of wear results. Sharp edges are thus maintained for easy penetration and leakage is minimized. Worn, blunt edges can be easily renewed in this manner and the penetrating ability of the bucket restored to its original efficiency. (See Fig. 1-2-3.)

CrNiV, CrNiMo or MnMo and High Carbon—see Fig. 5 for details.

Carbon steel and all alloy steels may be surfaced or rebuilt with one or more layers of hard-surfacing electrode. The hardness of a single layer of this type of weld metal will be from 500 to 600 Brinell, depending largely

upon the carbon or alloy content of the base metal and electrode.

The deposited weld metal has high resistance to deformation under impact, and relatively high tensile strength.

Hard-surfacing electrodes have a high degree of weldability. When properly made the deposit is flat and smooth; free from porosity, checks, cracks, and gas inclusions. The weld metal will not flake or break off under ordinary impact or bending strains.

The deposit is not machinable but may be ground to shape.

Welding Procedure

POLARITY: Reverse (electrode positive). These electrodes may be used with either A.C. or D.C. welding machines, D.C. preferred.

ARC LENGTH: A medium length arc is recommended; 27-30 volts.



FIG. 2



FIG. 3

CURRENT RANGES:

Size	Amperes
3/32"	40- 80
1/8"	60-100
5/32"	100-130
3/16"	125-170
1/4"	150-220

These welding currents are general and should be adjusted in accordance with the particular application; flatter beads and greater penetration are produced at the higher heats.

OPERATION: Any type of bead may be deposited, but a slight weaving motion is suggested. When it is desired to apply multiple passes, it is recommended that all beads be laid in one direction. Do not use irregular, crossing beads. When welding irregular shapes the beads should be deposited horizontally. Beads should not follow the contour of the object, but should be in straight lines over material of substantially the same thickness.

CAUTION: When welding carbon steel or alloy steel it is desirable to avoid overheating of a localized area. Best results are obtained with an even distribution of heat over as large an

bead adjacent to or over a previous bead until the first is completely cold. Water or air can be used on lip near weld to increase rate of heat removal. Sometimes welded on one side while stream of water is applied to opposite side.

Never weld hard-surfacing electrode directly onto manganese steel lip—only onto stainless steel base.

Hard Surfacing of New Lips and Teeth

CrNiV, CrNiMo or MnMo and High Carbon—See Fig. 6 for details.

Use same welding technique as for

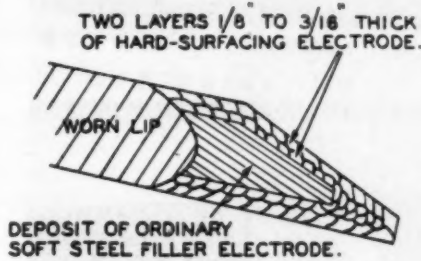


FIG. 5

depositing hard surfacing rod on built-up worn lips.

For high-manganese lips the extra wear obtained by hard surfacing does not ordinarily compensate for increased cost—also, danger of cracking lip is greater for high manganese than any other type.

Renewing Worn Chrome-Nickel Bucket Teeth

Use same technique as used for chrome nickel moly bucket lips except that sides of teeth should be covered with hard-surfacing material as well as top and bottom.

TEETH: It is most important that the tooth bolts be kept tight at all times. Otherwise, breakage of teeth and bolts is likely to occur. Hard-surfacing of the cutting edges of the teeth is advisable when excessive abrasion results in early wear and blunts cutting edges. The teeth should be kept sharp because worn and blunt teeth materially reduce digging efficiency.

Old Equipment Put to Work in No. Dakota

By RAY ROBINSON

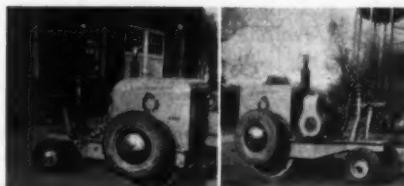
Maintenance Engineer, North Dakota State Highway Department, Bismark

One answer to our equipment shortage has been to round up obsolete units and put them back in service.

One example is a trailer-type road roller. The shop foreman in our Fargo shops has worked this machine over and made a self-propelled road roller of it without buying any new parts whatever. He used part of an



An old Russell motor grader purchased in 1927, and now repaired and put back to work for the duration



An old pull-type trailer roller was rebuilt, converting it into a self-propelled roller. All parts used were either made in the shop or salvaged from other worn-out equipment

old Ford axle, a small gasoline engine, and chains, drive gears, etc., that he salvaged from other equipment. The roller works very efficiently.

We have put many of our old slow-moving motor patrols back into service, due to the fact that we were unable to buy new ones. These old motor patrols are equipped with a 10-20 International motor; they are very slow, and travel at three miles per hour top working speed. Some

of these units are as much as fifteen years old. We are not making extensive repairs on these machines, but are tuning them up, repairing them in our own shops, and find that they will answer the purpose for the duration.

We have taken several old, discarded, V-type snow plows, rebuilt and remodeled them, and made them suitable for attaching to light trucks for snow removal.

We have repaired and put into service several old highway mowers that we had considered worn out. They are not as convenient as the new, modern type; however, we will manage to get along with them.

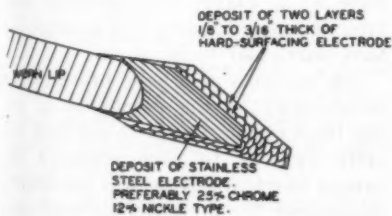


FIG. 4

area as possible. Weld a small area, then move as far away on lip as possible to weld next area. For alloy steel, even heat distribution can be improved by preheating entire lip before welding and, if necessary, during welding operation. For manganese molybdenum preheat to about 300° F. and for chrome nickel molybdenum to about 250° F. and about 350° F. for chrome nickel vanadium.

HIGH MANGANESE: See Fig. 4 for details.

SPECIAL PRECAUTIONS: Weld in such a way that original lip never becomes hot; that is, never weld one

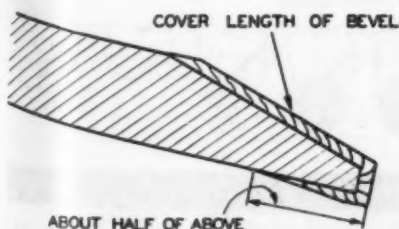
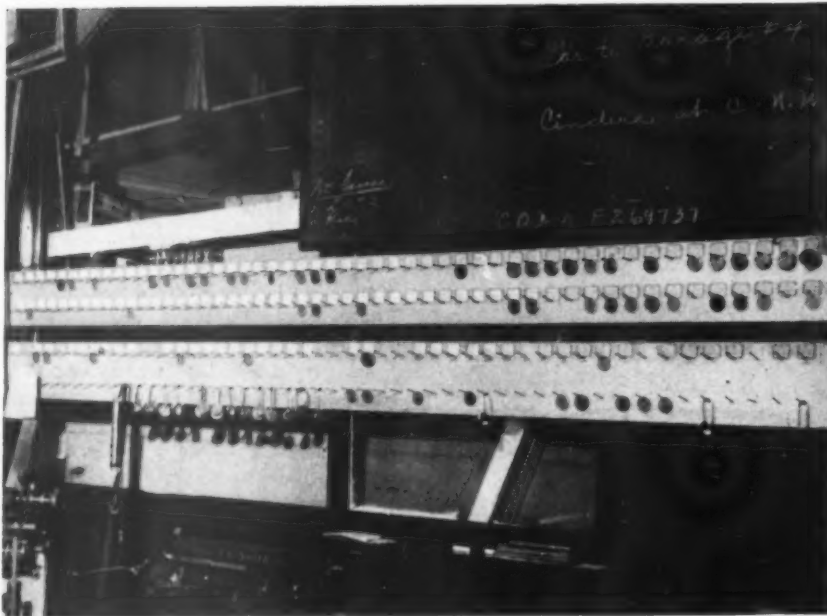


FIG. 6

A Tool Check-Up System That Works

By GEO. W. KORONSKI

County Engineer, Gogebic County, Michigan



This tool checking board has paid for itself many times over

“WHAT tools are signed out to Joe right now?”
“Where are all our post hole diggers?”

“We need two pipe wrenches—who’s got ‘em?”

Tools are mighty important in the day-to-day work of a county highway department, and questions like these are part of a big continuing “head-ache” unless there is a good system for checking and accounting for all small tools and implements. For there is nothing harder to keep track of—and nothing helps speed up a repair job like having the right tools on hand.

In many places it has been the poor practice of buying a new set of tools for each project or job because of a slip-shod tool system.

For these reasons we set about several years ago to devise a simple, sure system of keeping track of tools. It worked out like this:

First, each patrolman, mechanic or other employee was assigned a number.

Second, each man was given a supply of small brass checks, stamped with his number. These checks had small holes so they could be hung on a nail. The quantity issued depended on the number of tools the man was likely to be using.

Third, a large “tool checking board” was put up on the store clerk’s office

wall. On it were driven several long rows of nails. Each nail (see photos) was assigned to a specific type and size or model of tool unit (such as 24-in. pipe wrench, snow scoop, rake, hammer, etc.) with the name of the tool lettered just above it. The panel at present shows about 100 tool items.

Fourth, the panel was put to work, as follows:

John reports to the warehouse for a rake and a shovel. He is given the rake and shovel in return for two checks, each bearing John’s particular number. These are then placed on two separate nails, the ones tabbed “rake” and “shovel.” This procedure is repeated for each additional tool

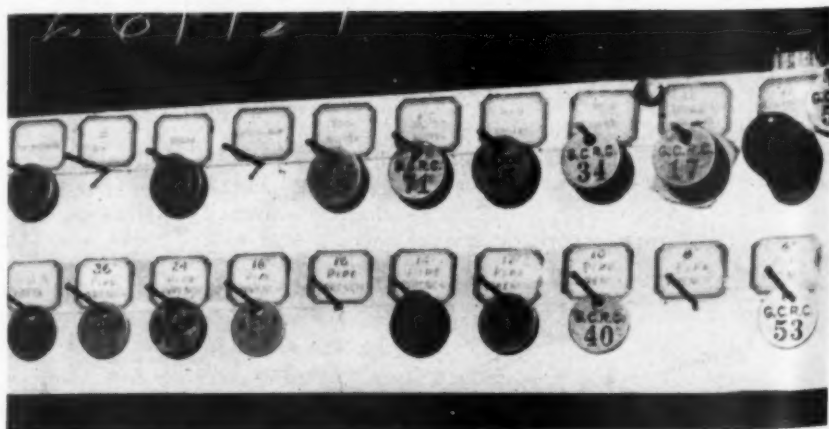
given out. Should John wish to return a shovel, we simply take John’s particular check off the “shovel” nail and return it to him.

In our early experience with this system we found that the individual worker must take care of his own checks and the panel must be operated only by those employed in the warehouse. We did at first attempt to take care of the checks, as the employees complained of losing them. This we found would not work as the employees would accuse the clerk of putting his check on a tool which he had never received and, of course, the clerk would say he did not, etc. We finally decided to give each man fifteen checks, charged a fine of one dollar if he lost them. In the six years to date we have collected only two dollars from an average of 65 employees.

In a nut shell, the advantage of this system is that it allows us to determine at a glance the quantity and type of tools out; and which employees have particular tools.

Our systems also have proved very satisfactory to the employees, it being their responsibility to see that the clerk returns to each employee his proper check which he has personally exchanged for a particular tool, and “No Check—No Tool” is our iron-clad rule in issuing our now scarce and often unreplaceable tools.

The estimated cost of this system was forty dollars and it has saved us at least that amount every month since by cutting tool losses and speeding up our work. The tool system is in charge of W. Bennetts, of our County staff.



A nail for each tool item, and a brass check for each tool out, is the system in Gogebic County, Michigan



Mississippi Builds Pile Driver From Salvage

Even before the present emergency causing a shortage of steel and other building material, the State Highway Department salvaged every piece of material which might possibly be used. This salvaged material was stored at the several district shops and is now coming in mighty handy.

An example of the use of salvaged material is now under way at the District Highway shop at McComb, in the Southern District. Under the direction of District Engineer T. C. Robbins, the men in the shop are using their spare time and salvaged material to build a pile driver. This piece of equipment will, when finished, be equal to any new pile driver which could be purchased, if such a purchase was possible, and will cost the Department practically nothing. The above picture shows work progressing on the leads of the pile driver.

Most of the material used was taken from a salvaged 50-ft. truss; the balance, taken from old simple spans and scrap tractors. Long members are a series of short pieces welded. All joints are welded except those specifically mentioned.

Gunnels are 50 ft. and leads 45 ft. in length. Lower end of lead support is fastened to cross member from gunnels with pin that remains in place. Lead support is 30 feet in length with leads carried on pivot pin through yoke to simplify driving batter piles. Diagonal brace to lead support is in two sections and telescopes. The lower end of bottom section is on rollers, and is so built that when leads reach vertical position the bottom section is rolled under hook and automatically stops leads in this position.

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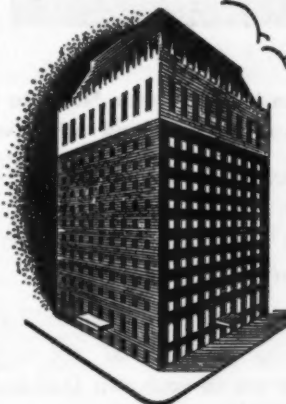
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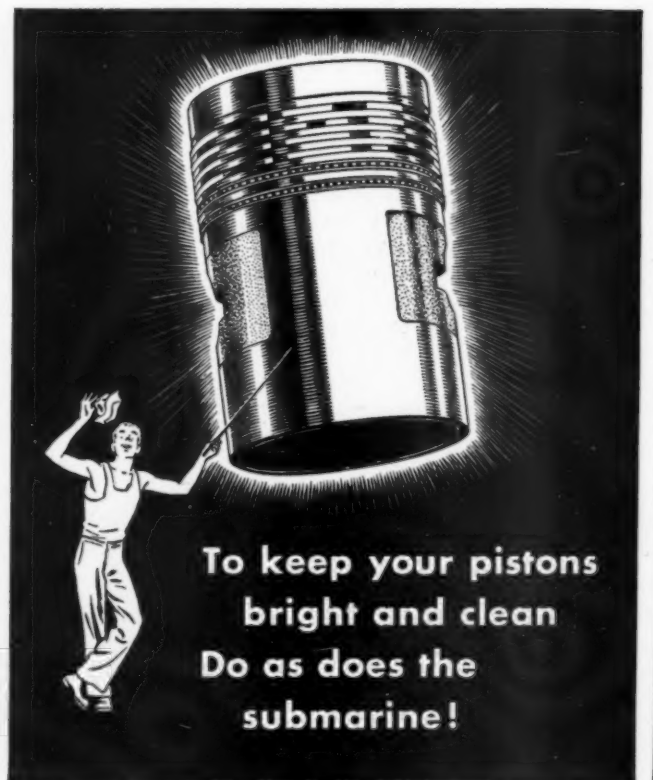
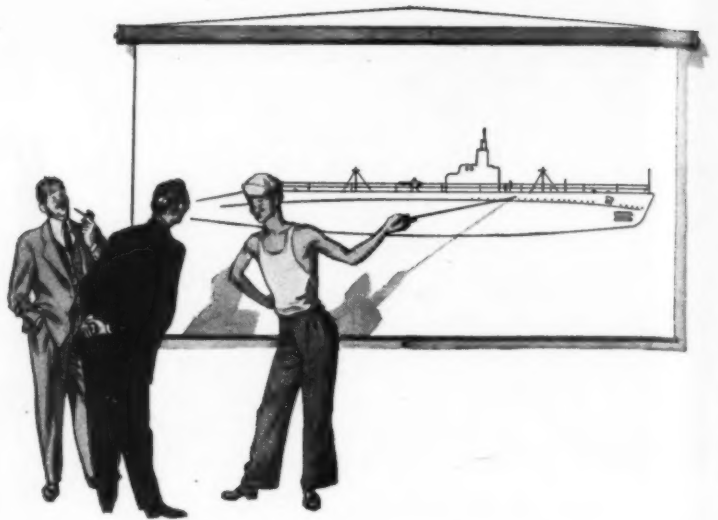
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Must keep its Diesels
running sweet . . .**



... use RPM DELO, used by the United States Navy to lubricate the powerful Diesels in our submarines and other warships.

These drawings, from actual photographs in our files, reveal the difference between two pistons, each run 846 hours in a test. One was lubricated with the finest straight mineral oil available, yet its rings were stuck with gum and the skirt was varnished.

The other, lubricated by RPM DELO, was protected by the non-corrosive, anti-oxidant properties that make "RPM" the world's finest Diesel oil. Put RPM DELO to the test in your own Diesels. You, too, will see how it retards ring-sticking and varnishing.



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STANDARD OIL COMPANY OF CALIFORNIA

ROADS AND STREETS, June, 1943

Wyoming Bridges Built with Salvage Materials

C. F. Seifried, state highway superintendent, Cheyenne, Wyoming, reports that practically all of the materials used in constructing a comparatively long bridge and an overhead for an access road is salvage obtained from several timber bridges. An overhead crossing west of Cheyenne is being torn down, to get material for a new overhead near Rock Springs. Another short span has been widened with salvaged structural members.

Maintaining West Virginia Roads Under War Restrictions

(Continued from Page 55)

ing, shoulder dressing, traffic service, repairing bridges, repairing and overhauling equipment, purchasing repair parts, new equipment and other materials, etc.

The fact that there has been a curtailment of new construction work, particularly WPA projects, will make it possible to now give the various maintenance operations more detailed engineering supervision, and it is expected that more efficient methods



Tire Spreader—another handy work saver made from old materials and parts (see page 80)

will be developed in connection with a number of these operations. Instructions have been given to those working in engineering supervisory capacities to spend more time with the gangs, which are actually doing the maintenance work, in order to give them the benefit of the closer, more detailed supervision.

Fifteen Specific War Economies

In order to reduce over-all maintenance expenditures to compensate

for the decline in revenues, together with budgetary reductions voted by the last Legislature—and also to conserve material—we have either developed or adopted the following methods or devices which may prove interesting to those in the highway industry.

(1) Oil reclaimers have been installed in each of our 10 District Headquarter's Shops. The Districts are comprised of from 4 to 7 counties, and the used motor oil is carried in

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Drott Bull Clam Shovel



Biting load from stockpile of sand—handles gravel, lime, coal, etc.



Hundreds of Drott Bull Clam Shovels are "doing their stuff" at home and on the front lines...all the way from burying garbage at service camps to throwing up barricades, filling-in bomb-craters, busting trails and roads through the jungle in out-of-the-way places for the Armed Forces, constructing airports! Handle the work of many units—bulldozers, scrapers, shovels, graders, clams, tampers, hoists, snow plows, etc. Dig, carry or float, backfill or load material...uproot and haul trees, boulders and debris! Countless diversified uses. Fit current model crawler tractors. Wire, write or call for full information.

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- Hydraulically controlled from operator's seat.
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- One to four yards heaped capacity...three to twelve thousand pounds lift capacity.
- Raising and lowering of front clam controls cut.
- Regular bucket interchangeable with special snow bucket.

from the county headquarters to the District Shops for reclaiming. Much of the oil has been run through the reclaimers time and time again, and we estimate that we are reclaiming oil for a state-wide average price of 9 cents per gallon, and we have reduced by 25% the amount of new oil purchased. Our laboratory tests show the oil to be entirely satisfactory.

(2) By trapping and condensing the oil bearing steam from the oil reclaimers, sufficient penetrating oil is obtained to take care of our needs of that product.

(3) We have already installed one and are in the process of installing four more metalizing units for use in

building up crankshafts, bearings, axles, etc. We believe that two Districts can be adequately served by one of these units, and from our experience to date we are confident they will pay for themselves in a short time. The initial cost is about \$500 a unit.*

(4) What are known as spark plug blasing machines have been installed in each of our District Shops at a cost of \$17.50 each. With these machines we reclaim and recondition spark plugs and find that we have reduced

* The use of this machine is of particular use in salvaging brake drums. A scored drum is ordinarily useless but by building the inside up with metal and then turning it back down on a lathe the drum can be restored to a new condition.

our spark plug bill at least 40%. We find that 75% of the plugs turned in for new ones are reclaimable.

(5) A battery reconditioning section has been set up in each of our District Shops, and all usable parts of old batteries are combined in rebuilding work. This has materially reduced our battery bill.

(6) Distilled water for batteries is made by condensing the steam used in heating bituminous material in storage tanks at the District Headquarters.

(7) We use to send all damaged and worn radiator cores to local repair shops and the cost per unit ran anywhere from \$4 to \$20. By setting up a radiator repair section we have effected a very substantial saving.

Keeps Pace in Salvage Methods

(8) Considerable effort has been expended in the salvaging of repair parts. Whenever a piece of equipment has served its usefulness as a complete unit it is dismantled and every usable part is carefully cleaned, inspected, catalogued and stored in special bins for future use.

We also scout around commercial auto graveyards to pick up good used parts to add to our salvage stock.

(9) Worn out motor blocks are being melted and recast into shapes from which we turn out rollers for the track assembly of caterpillar tractors and power shovels. Swing rollers for shovels are also made from this material.

(10) Front-End Loaders are now being built (see page 55) for each of our Districts, and eventually we expect to have one in each County. These loaders are mounted on a used 2½ to 3 ton truck chassis and are constructed entirely from salvaged material.

A power take-off is used to run an oil pump which operates an oil hydraulic hoist which raises and lowers the skip. The same hoist which was formerly used to lift the dump body is used.

The particular use for this machine is to load the material which is bladed from the ditch and shoulder out upon the edge of the road surface with a power grader. Loading this material by hand is a very expensive labor operation. Besides, the truck stands idle a large part of the time while being loaded. This machine with one operator will load a truck in about 3 or 4 minutes. The loaders are also used for loading aggregate from stock piles.

The total cost of converting a dump truck to one of these Front-End Loaders is between \$400 and \$500, and the machine is naturally a very mobile

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There is nothing to match hard-boiled war service to disclose the weaknesses or prove the strength of a piece of machinery.

That the Buffalo-Springfield roller is meeting every test... proving itself a good trooper testifies to its inherent soundness of design and rugged construction.

For the duration, in service on five continents and available to military contractors only.

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ROLLER CO.
SPRINGFIELD, OHIO**



BUFFALO-SPRINGFIELD ROLLERS

unit, as it can be moved as fast as a truck.

We also have several of these loaders mounted on rubber tired wheel tractors which makes a very satisfactory unit. The tractor should be a 30 size.

(11) A Tension Member Tightener has been developed (See Figs. 1 and 2, page 55) for use in equalizing the tension in companion I-Bar members in pin-connected steel bridge trusses.

In many old bridges, particularly those which have been re-erected, will be found loose tension members. These loose members result in destructive vibration; also, by not carrying their share of the load, cause their companion member to be overstressed.

(12) A Wire Cable Cutter (See Fig. 3 and photo) has been developed in one of our districts for use in store-

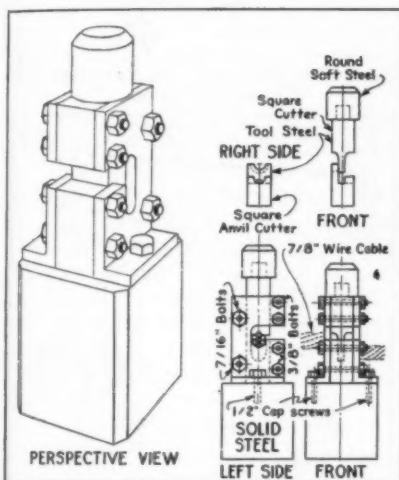


Fig. 3—Details of wire cable cutter



Showing one of the shop-made cable cutters

rooms to simplify the cutting of wire rope or cable. This is a small simple device and has proven to be very adequate for the purpose for which it was designed. The cable to be cut should be wired on each side of the point where the cable is to be severed in order to prevent raveling at the ends.



Bituminous Runways are Quicker to Construct...Cost Less...Last Longer!

The age of aviation is *here* . . . and the quicker business men and public officials realize it . . . the better off their respective communities will be in post-war years! Plans are already under way . . . specifications set . . . for many an airport . . . ready to start construction as soon as Victory is won. And in these plans, *seamless* bituminous runways play an important role.

All over the world, citizens have seen how Allied armies and navies are dotting deserts and jungles,

valleys and plateaus with quickly constructed, low cost bituminous landing fields. These resilient bituminous surfaces "take" the full shock of landing huge transports, yet seem to "give" beneath the wheels to "cushion" the landing. Maintenance men believe the smooth black runways are less abrasive, less wearing on tires. And pilots claim they are less glaring on the eyes, easier on the passengers. Get complete details in new *free* booklet—write for *your* copy!

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ROADS AND STREETS, June, 1943

(13) A Test Hole Hand Earth Auger (See Fig. 4) has been developed, and this very simple device which is easy to make from salvage material is being used for the following purposes:

(a) To obtain foundation data for bridges and culverts.

(b) To find the slide plane upon which slides are moving, which in many instances may be accomplished by examining the material from the bit as the drilling proceeds.

(c) To drill at points where there is an unsatisfactory drainage condition to determine either the height

of the water-table or the presence of an unusual amount of ground water. Unsatisfactory drainage conditions are responsible for most of the damage to our pavement surfaces.

(14) To obtain additional wear from worn grader blades, we are using the methods outlined in Fig. 5 and 6. The method shown in Fig. 5 was developed in Minnesota; the one in Fig. 6 in Maryland. Both methods are satisfactory and certainly conserve material.

(15) A hydraulic tire spreader (See photo, page 77) was built in one of our district shops entirely of salvaged

materials. It is a handy practical time saver.

"War Prime" for Stone Roads

At the beginning of the war we had quite a substantial mileage of un-

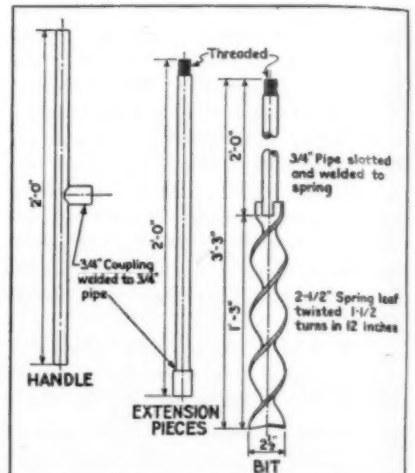


Fig. 4—Test hole auger has many labor and money saving uses

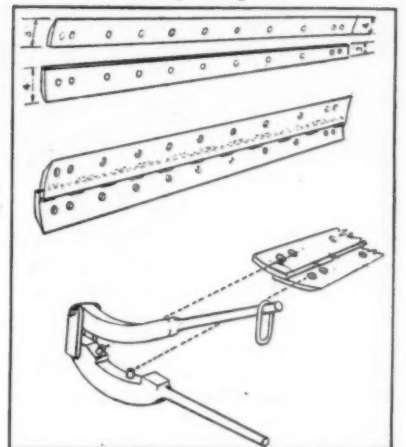


Fig. 5—Now used in West Virginia and many other places is this method of salvaging grader blades developed in Minnesota. Match narrow ends with wide ends. (The figures 3" and 4" are for example only). Lap should not be less than one-half inch wide. Three-inch welds and 3" spaces, alternating front and back; that is, a space is always opposite a weld. Beginning with one weld in center, shift to opposite side and place two welds, shifting back again, placing two more welds and so on, working toward ends of blades until finished as shown

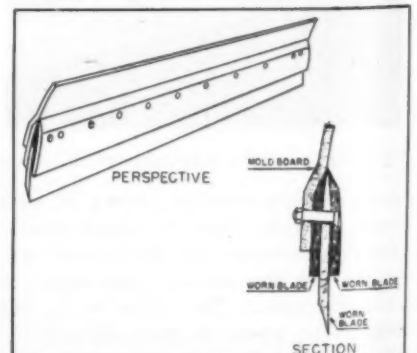

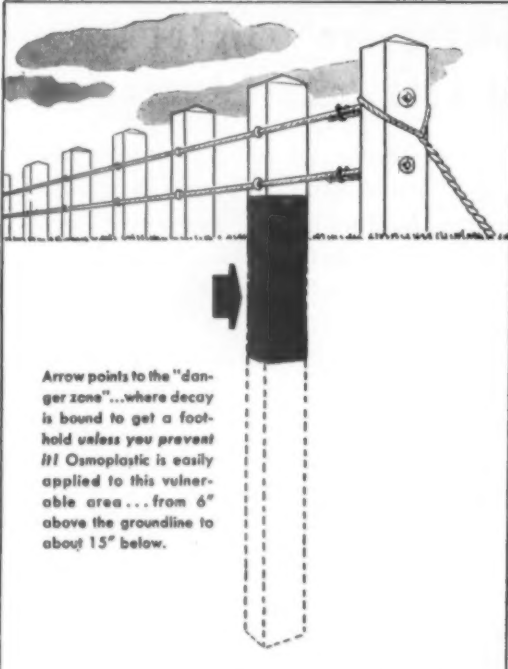


Fig. 6—How W. Virginia road shop bolts worn grader blades to mold-boards (method credited to Maryland)



GUARD

AGAINST Guard Post Decay APPLY OSMOPLASTIC



Arrow points to the "danger zone"...where decay is bound to get a foothold unless you prevent it! Osmoplastic is easily applied to this vulnerable area...from 6" above the groundline to about 15" below.

When rotted highway guard posts snap off at the ground line, not only money but manpower is the high price paid for neglect. The solution is: Stop decay where it starts...before it starts...with OSMOPLASTIC!

Many highway engineers have found this economical method of applying OSMOPLASTIC is highly effective on all timber installations...not only guard posts but bridges, culverts, guide and fence posts. Wherever timber touches timber...or humid earth...or is set in water...OSMOPLASTIC adds valuable extra years of service.

It costs little to apply this topnotch wood-preservative, and it is so simple to daub it on. Mail the coupon below for full details as to how you can save your timbers today from decay tomorrow...with OSMOPLASTIC!

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treated stone base roads, a good deal of which had been constructed with federal funds by WPA. Under normal conditions such bases would have been primed with about $\frac{1}{2}$ gal. of tar to the sq. yd. and then a bituminous surface from $\frac{1}{2}$ to $1\frac{1}{2}$ in. in thickness would have been applied. Instead, due to restrictions, we have designed and used to good advantage what we term a "War Prime." The specifications for this War Prime is as follows:

1. Clean and sweep the base.
2. Apply 0.35 gal. tar (RT 1 to 3) per sq. yd.
3. Spread 15 lb. aggregate No. 8 to $\frac{3}{4}$ -in. in size and level with a broom drag.
4. Apply 0.25 gal. tar (RT 8 or 9) or asphalt (RC 3 or 4).
5. Spread 5 lb. aggregate No. 8 to $\frac{3}{4}$ -in. in size. Broom-drag and roll to finish.

In conclusion, I might say we are now wondering why we have not used many of these conservation methods in the past years instead of waiting to be forced into it by the war. Most of these wartime developments are so simple, practical and common-sense in their application to our work that I feel we have been negligent in our duty as State Officials for not having gotten on our toes long ago. There is an old saying by John Haywood, "An ill wind that bloweth no man good." This war with its resultant drain upon our normal resources has and will provide the necessity which is the mother of invention. And America, as the result of the war, will be twenty years further advanced in science, inventions and the ability to conserve than it would have been had the necessity to develop them not forced us to step up our thinking.

A. W. Brandt of New York Public Works Dept. Retires; Charles H. Sells Successor

(Just as we go to press comes news of the sudden passing of Mr. Brandt see page 86 for details.)

Arthur W. Brandt, who has served as head of the New York state department of public works for the past four years, has retired after three decades of nearly continuous service in the department.

A native of New York, Mr. Brandt graduated from Tuft's College in civil engineering in 1912, entering the employ of the state soon after in the division of canals and highways. During World War I he was a Captain in the First Engineers, First Division. He re-entered state work with appointment as secretary and second commissioner of the New York

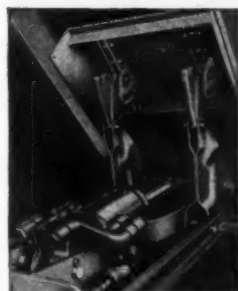
A HERCULES HYDRAULIC BOOSTER HOIST

**MAKES ANY
TRUCK A...
DUMP TRUCK**



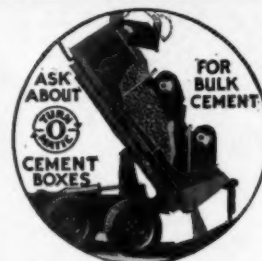
Install HERCULES DOUBLE-ARM HYDRAULIC HOISTS under your platform, stake, express or special bodies, which are now idle. Unload the easy way!

With wartime restrictions preventing your purchase of all the new equipment you need, it's more important than ever that present equipment be used at maximum efficiency.



Model KXE Hercules Booster Hoist, with 6" cylinder, for bodies up to 12 feet long. Rated capacity of 4 tons with a 9 foot body. Control valve is operated from the driver's seat, and the low oil pressure required assures long life of unit.

Reinforcing plate relieves lifting strains. Assembly includes 12 foot steel sills for reinforcement of wood body sills.



HERCULES STEEL PRODUCTS CO. GALION, OHIO

division of highways, succeeding to the highway commissionership in 1924 and head of the public works department in 1939.

C. H. Sells, who has been appointed by Governor Dewey to succeed Mr. Brandt, is an engineer of wide experience, including extensive service abroad. Recently he directed a lease-lend construction program in the Far East, and engaged in airport engineering work in South America.

An engineering graduate of University of Colorado, Mr. Sells gained engineering experience in connection

with New York City subway construction. In 1921 he became assistant engineer of Westchester County, N. Y., advancing to county engineer in 1935 and public works commissioner in 1938.

Funds Provided for Repairing Flood Damaged Roads

President Roosevelt has authorized the allotment of \$5,000,000 to \$7,000,000 of Federal Aid Highway funds to several Middle Western states for the repair of roads and bridges damaged by the floods of last month.

Critical Road Conditions II

(Continued from page 50)

was, we would estimate, 50 per cent greater than normal. The southern part of the state was about the same as usual. Heavier traffic in the upper weight brackets has definitely added to our maintenance requirements on the heavier traffic routes, such as U.S. 66, 40, 71, 36 and 61.

Our planned maintenance expenditure for 1943 is \$5,700,000, an increase over the actual expenditure in 1942 of \$4,270,000. But we do not anticipate being able to spend this amount due to lack of manpower.

Bituminous material needed for 1943 will approximate 6,000,000 gallons for our 3700 miles of bituminous surfaces and other needs.

Our No. 1 preventative or stop-gap maintenance method is the use of the mudjack for filling voids under concrete pavements, which if not filled results in center breaks and a general failure of concrete pavement.

Maryland—Good Shape

Frank P. Scrivener, maintenance engineer, Maryland state roads commission:

Generally, the state roads have

come through the winter in a very satisfactory manner, and will not require considerable sums for patching. Another help has been the fact that while we have had a long winter, it was not necessary to spend the average funds in snow removal and ice treatment.

Funds available for maintenance on the State system for the fiscal year, will be approximately two million dollars, about the amount expended in 1942.

Of the twenty-three counties in the State, this Commission maintains fourteen. These county roads have generally come through the winter in a very satisfactory manner and with the usual amount of maintenance, we hope to go into the winter with them in as good shape, if not better, than they were last fall. This is generally true of the roads in the nine counties under County Engineers not connected with this Department.

The principal type of betterment under maintenance and reconstruction funds, is the placing of bituminous shoulders adjacent to narrow pavements and the correction of roads in the secondary system which have a poor cross section. Our surface treatment program this year will consist of approximately 2,500,000 gallons of bituminous material, plus an additional 2,000,000 gallons for spot patching work.

Texas Maintenance Well in Hand

M. B. Hodges, maintenance engineer, Texas highway department:

Maintenance needs in Texas this year are about in line with previous years. True, in many instances we are experiencing a considerably heavier volume of traffic, especially on those highways in the vicinity of cantonment areas, of which Texas has many. Fortunately, weather conditions last winter were ideal in Texas with minimum rainfall and the lightest snows in several years in the Panhandle. For this reason, we are entering the summer months with the highways in possibly the best condition in years.

It is a well known fact, however, that there has been a marked change in the traffic trend. Prior to the present emergency and the passage of a statute which raised the gross load of trucks, a great preponderance of our traffic was passenger vehicles. During the past year we find a reverse condition. A heavy volume of freight is being carried over our highways in cargo trucks, and this, coupled with the fact that we have many military units located throughout the State, has caused a very material increase in heavy truck traffic. This type of traffic has without question



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A Model 105 SCHRAMM Compressor with special racks and tool boxes with fixed locations for each tool and accessory, so that most any compressor requirement that arises can be met and handled. Equipment includes: Double hose reels, live air type, each equipped with three 50 ft. lengths of 3/4"

air hose. Air receiver with three extra outlets, equipped with quick action valves, hose couplings and 3 1/2" vise for flat or pipe work, on swivel base. Tools recommended depend entirely on users' requirements and the ability of tool manufacturer to furnish them under existing conditions.

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SCHRAMM, INC.

THE COMPRESSOR PEOPLE

WEST CHESTER, PENNA.

caused rather rapid deterioration on many of our highways, and especially those which were constructed several years ago when such type of traffic was not anticipated.

The maintenance budget for the fiscal year beginning Sept. 1, 1942, is exactly the same as for the previous year, per mile of highway. In allocating such a budget, it was not anticipated that the entire amount would be spent; actually for year 1941-42 about \$500,000 was returned to the Available Surplus at the end of the year. This no doubt was caused by a sharp decline in traffic over most roads, and the lack of materials, equipment, and personnel, with special emphasis on materials. During the present fiscal year, the material situation has readjusted itself almost to a point of normalcy. Our big problem now is manpower and equipment. Spare parts are rather difficult to obtain. Fortunately, through the ingenuity of our District Engineers and District Mechanics, we have been able to keep most of our equipment in operation. In addition, we have been leasing various items of equipment from counties, contractors, and equipment houses with which to perform a rather large program of maintenance betterment work, on which we could

not secure bids from contractors in view of the large army camp and cantonment construction work under way. This work of course is rapidly nearing completion, and during the past two or three months we have noted a marked increase in bidders on construction and betterment work. This may assist materially in the equipment problem, and to some extent our manpower problem.

Texas Doing 1500 Miles Bituminous Work

An asphalt program was recently developed involving \$3,000,000 expenditure on 1,507 miles of highways. This program was prepared in hopes that other agencies involved in issuing asphalt certificates would realize the many failures occasioned by wartime traffic (material can be transported in tank trucks and not in tank cars). In addition to this program, we had a carry-over from a similar program in 1942 of \$1,500,000 not performed due to the lack of equipment and materials. We are pleased to advise that other agencies did understand our situation and conditions and did cooperate wholeheartedly in granting all of our requests for this material, and this program is under way at this time. We feel that by early fall, the

program will have been completed, and those highways on which the work is being performed will be placed in excellent condition for wartime traffic.

The type of work to be performed under this program varies from a seal coat to complete reconstruction of sections which have failed. In many instances, we are placing retreads of either asphaltic concrete or limestone rock asphalt to seal, level up, and provide a smooth and non-skid riding surface. We are using this same method on some sections of concrete pavement as temporary relief, pending complete reconstruction.

In this State we use no tar or calcium chloride, and cement has never been particularly critical except for one period of two or three months, and we have been able to buy this material without any particular difficulty. In the repair of timber structures, however, we are experiencing some trouble in the purchase of treated timber, or for that matter, any type of pine timber. In the State we have many local mills which are producing less than 5,000 feet a day, and our District Engineers are continually seeking out such mills and making emergency purchases commensurate with their needs. The timbers are then treated with a creosote

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because of **WELDED**
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solution which of course is not to be compared with pressure treated, but will be much better than untreated material.

The highways in Texas, except on a few isolated sections, are in as good or better state of maintenance at this time than in many years, despite increase in heavy truck traffic. This condition has been brought about by the initiative and ingenuity of the District Engineers and their staff of co-workers. These men have really been put to a test and they have come

through in grand style. They have lost many of their skilled laborers to various governmental agencies, and especially to contractors where the rate of pay is much higher. This apparently has not deterred them one bit, and other men have been trained to take their positions. Many spare parts are being made in the District Shops, and much of our equipment is still being used for this reason. At the moment, the material and equipment situation is well in hand, and our pressing problem is manpower or personnel.



Speeds Maintenance and Repair Work — Makes New Roads Out of Old



A copy of this pocket-size BITUVIA manual will be sent on request.

● The speed with which BITUVIA can be applied, together with its other properties, makes it the logical material for war-time maintenance and repair work. BITUVIA penetrates deeply and binds firmly, assuring long, economical service. The resilient, skid-resistant BITUVIA surface contributes to safe driving and longer tire-life. Standard grades to meet all Federal, State, County and Municipal specifications.

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Indiana Plans \$100,000 Flood Repair

Estimates placing flood damage to bridges on the state highway system at \$100,000 have been submitted by the engineering staff of the State Highway Commission, it was reported today by S. C. Hadden, chairman.

Surveys indicated that there were thirteen structures on the state system which were washed out and severely damaged.

Three Congressional Investigations of War Highway Program

The U. S. House Roads Committee recently voted to set up three subcommittees to investigate the various phases of the highway program as related to the war effort. Representative Jennings Randolph of West Virginia will be chairman of the first subcommittee which will investigate war damage to highways, together with various governmental procedures affecting highway construction and maintenance. Flood damage to highways will be investigated by the second subcommittee under the chairmanship of Representative Whittington of Mississippi. Chairman Will Robinson of Utah will head the third subcommittee which will make a complete investigation of military highways, including the Alcan Highway. A resolution calling for the establishment of these subcommittees is expected to be introduced and the investigations started immediately thereafter.

Believe It or Not, a Portable Crusher

Up in Gogebic County, in Northern Michigan, winters are real winters,



and when a portable crusher is put out "on location" for winter work, why not build a house over it?

That's exactly what Geo. W. Koronski, Gogebic County Engineer at Bessemer, did. Its architecture isn't Cape Cod, but it helped a lot to protect crushing machinery from snow and cold during recent WPA winter stock-piling operations.

CORONACH

*"Of those immortal dead who live again
In minds made better by their presence."*

JOHN MEYER, secretary of Sauerman Bros., Inc., died in Chicago on May 14, age 46. Mr. Meyer was born in Chicago and was engaged in railroad construction and engineering work in that city before joining the Sauerman organization as production manager in 1929. He was elected secretary of the company in 1942. He leaves a widow and two daughters.

JOHN F. STEVENS, one of the world's great civil engineers, died June 2 in Southern Pines, N. C., at the age of 90. He was born in West Gardiner, Mo., April 25, 1853.

His name is linked with such great engineering projects as the extension of the Great Northern railway across the Rocky Mountains, the building of the Panama Canal and the rehabilitation of the Siberian and Chinese Eastern railways in the days of the first World War.

When Mr. Stevens was 21 he obtained his first job in the field for which he had fitted himself. He became assistant engineer for the city of Minneapolis and two years later undertook railroad service. He started as chief engineer of the Sabin Pass & North Western railway, and in 1879 was appointed assistant engineer on the Denver & Rio Grande. The next year he went to the Chicago, Milwaukee & St. Paul in the same capacity and two years later became a division engineer of the Canadian Pacific.

He returned to the engineering staff of the Chicago, Milwaukee & St. Paul in 1886 and soon afterward became a principal assistant engineer of the Duluth, South Shore & Atlantic. In 1889 he became an assistant engineer of the Spokane Fall & Northern and next changed to the Great Northern as assistant chief engineer.

Mr. Stevens was made chief engineer of the Great Northern in 1895, and became general manager in 1902. A year later he joined the Chicago, Rock Island & Pacific as chief engineer, and in 1904 was promoted to vice president.

In 1905 Mr. Stevens was appointed chief engineer of the Panama Canal by President Theodore Roosevelt, and he was in charge of the construction work until April 1907. He was also chairman of the Isthmian Canal Commission in February and March, 1907.

After his resignation from the Panama Canal Commission the work was placed in charge of the War Department. Mr. Stevens became vice president in charge of operations of the New Haven Railroad. From 1909 to 1911 he spent two years as president of a group of Great Northern subsidiaries in the Pacific Coast area, and from 1911 to 1917 practiced engineering privately in New York.

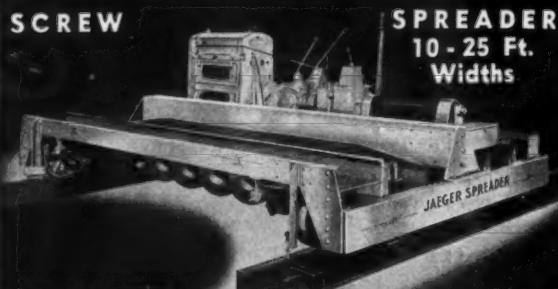
With the entrance of the United States into the first World War, there came an appeal for immediate help from the Kerensky government to solve Russia's transportation problem. President Wilson appointed a group of experts to this task, and Mr. Stevens became its chairman. They had just begun their work when the Kerensky

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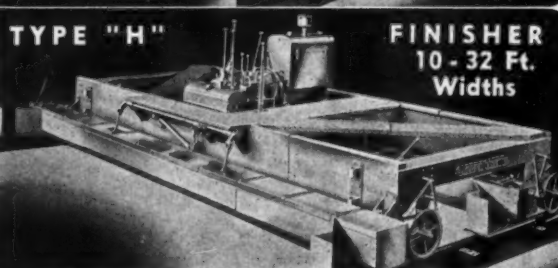


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Screw reworks as it spreads; means denser, more uniform texture. Handles driest mixes.



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**NO UPKEEP • QUICKLY INSTALLED
MAXIMUM VISIBILITY • PERMANENT
WHITE • SURFACE REMAINS ABRASIVE
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Proper Size Aggregates—on the Job
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ROADS AND STREETS, June, 1943

regime was overthrown and all members of the commission, except Mr. Stevens returned home.

Mr. Stevens then became chairman of the Allied technical board that kept the Transsiberian railway running until the Allied troops were withdrawn from Siberia in 1922. But it was not till sixteen years later that facts regarding Japanese efforts to block the operation of the road became known through publications of the State Department.

A. W. BRANDT, New York State commissioner of public works until his resignation only a few weeks ago (see page 81), died suddenly June 11 while in Washington on business connected with his interest in a post-war public works program for his state.

The *New York Times* paid him the following paragraphs of tribute:

"Captain Brandt's death is a great shock to all of us who had the pleasure of working with him," Governor Dewey said. "He was a fine public servant and his passing will be a great loss to the engineering profession."

"During his fifteen years of service as State Highway Commissioner, the post he occupied before being appointed Superintendent of Public Works, he supervised the construction of thousands of miles of highways. He was credited with introducing a retreading process which has saved the State millions of dollars.

"As State Highways Commissioner from 1924 to 1929 and as Superintendent of Public Works from 1929 to 1943, Captain Brandt took an important part in the development of the State's system of highways. He collaborated with Park Commissioner Robert Moses in establishment of the parkways system in Long Island and Westchester County.

"During his tenure as highways commissioner he was credited with being an astute "diplomat" in New York's dealings with Washington.

"During his term of service the State had its best years of highway construction and saw the greatest changes in highway design and construction equipment. When war clouds began to lower, he pushed roadways needed for defensive purposes. He strongly advocated super-highway systems as the best solution of the complex traffic problems.

"Born in Wayne County, N. Y., the son of Dr. John S. Brandt, a country physician, he was graduated from Tufts College School of Engineering in 1912."

C. W. HUDSON, bridge designer, dies. Clarence Walter Hudson, 75, retired consulting engineer and a designer of many large bridges in the United States, including the Victory Bridge at Perth Amboy, died May 10.

Born in Manasquan, N. J., Mr. Hudson was graduated from Lehigh University in 1889 as a civil engineer. In 1925 Lehigh conferred upon him the degree of Doctor of Engineering in recognition of his ability in designing the bridge which made one city of the three smaller municipalities now forming Bethlehem, Pa. During his long career as a consulting engineer Mr. Hudson also designed the Washington Bridge at Providence, R. I., and many other spans.

From 1892 to 1906 he was employed as a designing engineer for the Phoenix Bridge Company of Phoenix, Pa. He became a partner of the late Dr. Mansfield Merriman in 1907, opening consulting engineering offices in New York. Dr. Merriman retired within the year and Mr. Hudson carried on the business until 1933.

Mr. Hudson was Professor of Civil Engineering in charge of the Department of Civil Engineering of the Polytechnic Institute of Brooklyn from 1907 to 1927.

Designed for

EXCEPTIONALLY EFFICIENT PENETRATION

COMPARABLE with our amazing new mobile cannons for effective penetration of the heaviest tank armor are Owen Buckets designed especially for fast, deep digging unusually difficult materials such as hardpan, quicksand, coal in the vein, etc.

THE OWEN BUCKET CO.

BREAKWATER AVE. • CLEVELAND, OHIO

BRANCHES: New York, Chicago, Philadelphia, Berkeley, Cal.

**OWEN BUCKETS**

A MOUTHFUL AT EVERY BITE



UNTIL THE WAR IS WON
... highest priorities are diverting the new BYERS excavator you want to war fronts all over the world

In the meantime, owners of current and older models of Byers shovels and cranes may depend on Byers Parts Service to help them keep present equipment working steadily and satisfactorily.

WHEN THE WAR IS WON

Byers will offer you new, improved, faster mobile cranes and shovels for peacetime jobs.

BYERS**CRANES
AND
SHOVELS**

RAVENNA, OHIO

DISTRIBUTORS THROUGHOUT THE WORLD

LESSMANN MANUFACTURING COMPANY
DES MOINES, IOWA**Shovels—Lifts—Hoists—Cranes—8,000 built.**

Many sizes now available on proper priorities.

Capacities: Shovel, $\frac{1}{2}$ to $\frac{3}{4}$ yard, lifts and dumping clearance optional, hoists or lifts 2 to 5 tons, cranes stationary boom or drop boom 1 to 5 tons.

Machines may be furnished to specification if desired.

Units powered by 25 or 45 horsepower. Rear tires, road builder type, 13:50-24 wide base rims. Front tires 6:00-20 truck and bus tires. Unit also equipped with special front axle and rear axle. Special steering gear and transmission ratios.

Units really built for shovel or hoist service, not an ordinary tractor unit.

Weight ranges from 5,000 to 12,000 pounds per unit.

Ask the owners of Lessmann units for there is a reason for so many re-purchases.

Sewing *Moving*

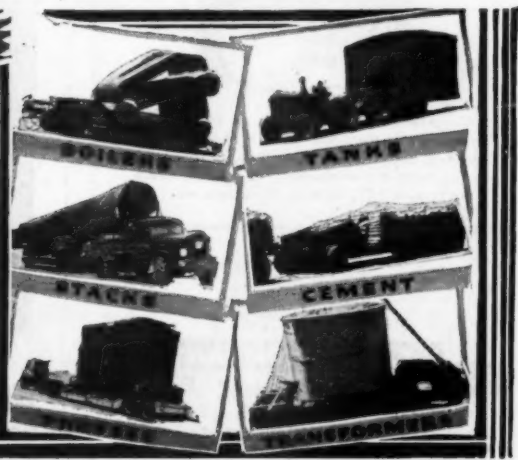
the "FACTORY FRONT" too!

ROGERS

LOW BED - HEAVY DUTY

TRAILERS

ROGERS BROTHERS CORP., ALBION, PENNA.



ROADS AND STREETS, June, 1943



DIETZ LANTERNS ARE MADE OF SCARCE MATERIALS

— here's how your maintenance men
can keep them in good condition.



Always keep filler hole covered—if cap is lost, replace it. Occasionally, when fuel is low, drain out the fount to remove any accumulated moisture to prevent pitting, leaks, etc.

Keep wick properly trimmed—replace it when necessary.

To properly trim wick, cut straight across top—trim away any extended or loose threads, nick the corners slightly



Keep globes clean. Dirty globes reduce visibility. Replace damaged ones.

Don't turn wick too high. This creates soot, clogs tubes, reduces air flow, cuts down candle power, wastes kerosene.

KEEP A SUPPLY OF DIETZ LANTERN REPLACEMENT PARTS ON HAND



We recommend that you keep on hand an inventory of extra DIETZ Lantern Red and clear globes, and wicks for instant replacement for every need and emergency. Your supply house can furnish DIETZ burners, filler caps, etc.



R.E. DIETZ COMPANY
1840 **NEW YORK** 1943

Output Distributed Through the
Jobbing Trade Exclusively

ROADS AND STREETS, June, 1943

N. J. Detour Uses Railroad Bridge

With all work completed in one-half the time normally required for similar construction, the new Newark-Harrison Route 25A Detour, using the Hudson & Manhattan Railroad Bridge, was opened for traffic late in May. White traffic lines have been painted and reflector buttons placed on the bridge timber wheel-guard as a guide for night driving, and cables have been strung in guard rails. The contractors were Ell-Dorer Contracting Company of Irvington, N. J.

Ohio Post-War Planning Conference

The State Highway Department of Ohio is to hold a post-war highway planning conference June 24 at the Neil House, Columbus, Ohio. The sole purpose of the conference is to set up a coordinated logical workable approach to the entire Ohio post-war highway problems. An attendance of approximately 300 county and city en-

gineers, service directors, county commissioners and planning commissions, Chamber of Commerce representatives, etc., is expected.

The program will open at 9:30 a. m., with an address by Charles M. Upham, Director-Engineer, American Road Builders' Association. The afternoon services will start at 1:30 p. m.

Truck Crashes Through Bridge; 18 Soldiers Killed

Eighteen soldiers were killed and 10 injured at Nashville, Tenn., early June 6, when an army truck in which they were riding crashed through a bridge over a railroad right of way, falling 50 feet to the tracks below.

Oops! Sorry!

Last month ye editors (or maybe it was the printers), got the names switched under these two banquet photos, taken at the A.R.B.A. annual meeting. The names are right this time.



At the President's Banquet: (From right) Charles M. Upham, engineer-director, ARBA; Carl W. Brown, president-elect, chief engineer, Missouri highway department; toastmaster Paul B. Reinhold, vice-president ARBA, and president Reinhold & Co., Pittsburgh, Pa.; guest speaker, Hon. Jennings Randolph, Member U. S. House of Representatives roads committee



(From left) Carlos Bazan, Director General of Highways of Mexico; Jose Rivera, Secretary ARBA Pan American Division, Mexico City; Hon. Dennis Chavez, Member, Committee on Post Offices and Post Roads, U. S. Senate; Hon. James W. Mott (Ore.), Member, U. S. House of Representatives Roads Committee

WITH THE MANUFACTURERS

Universal Engineering Wins Army-Navy "E"

The Army-Navy "E" was awarded the Universal Engineering Corporation, Cedar Rapids, Ia., on May 19.

Hugh A. Wallace Appointed District Engineer for Asphalt Institute

Bernard E. Gray, General Manager of The Asphalt Institute, has announced the appointment of Hugh A. Wallace as District Engineer for the territory comprising Texas, Oklahoma and



H. A. Wallace

Arkansas, with office in the Southwestern Life Building, Dallas, Texas.

Mr. Wallace's engineering experience for the past twenty years covers service in the Texas State Highway Department and the Southwestern Division of the U. S. Engineers. In the Highway Department he started as an Assistant Engineer on Highway Location and Construction in West Texas, later serving as Assistant Resident Engineer in Dickens and Baylor Counties, Maintenance Superintendent in the Lubbock district, and for the past ten years in the Maintenance Division at Austin, his work there including general supervision of Force Account Construction for the entire state.

Executive Personnel Promotions by Marquette Cement

The Marquette Cement Manufacturing Co. has announced the following promotion of executive personnel, effective May 1:

D. S. Colburn, vice-president and assistant treasurer, formerly vice-president. V. J. Hanley, secretary and treasurer, formerly secretary and assistant treasurer. F. L. Jaeger, vice-president, formerly general sales manager. L. W. Saxby, assistant to the president and assistant treasurer, formerly assistant to the president. S. L. Cribari, assistant to the president, formerly assistant treasurer.

WHERE COMMUNICATION LINES ARE *Vital*

How often the outcome of battle "hangs by a thread" — the communication line that must be established and maintained even under fire! On many fronts, reels powered by small gasoline engines help lay these vital lines. Thus thousands more Briggs & Stratton engines swell the ranks of the hundreds of thousands of these rugged, dependable engines already serving our armed forces in many ways.



IN the interest of most efficient engine operation, all users of Briggs & Stratton 4-cycle, air cooled gasoline engines are urged to maintain the following

4-POINT SERVICE PROGRAM

1. Frequent lubrication with proper oils.
2. Periodical engine inspection.
3. Always keep engines properly adjusted.
4. Keep engines clean.

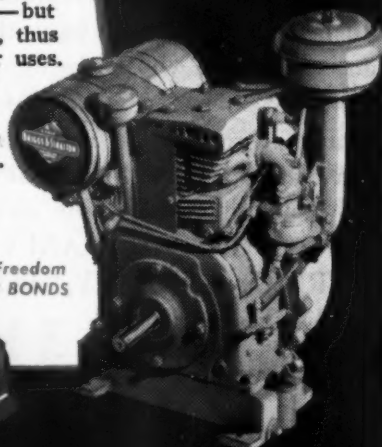
This systematic care will not only assure better, longer engine service—but will prevent unnecessary repairs, thus saving critical materials for war uses.

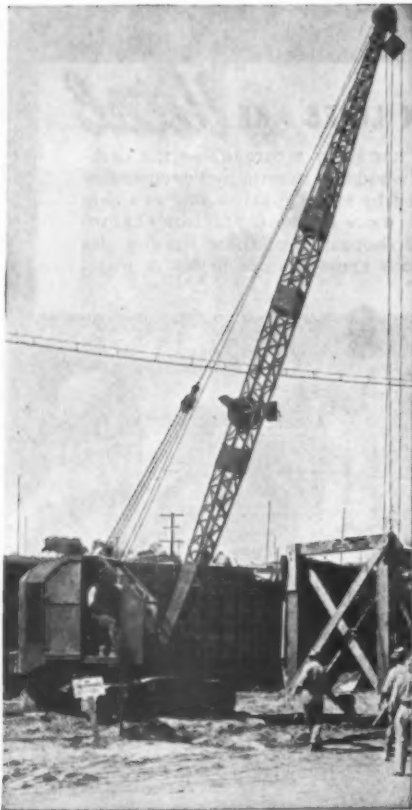
So, keep your engines in good condition. Your nearest dealer or Briggs & Stratton Service Station will gladly help you.

BRIGGS & STRATTON CORP.
MILWAUKEE, WIS., U. S. A.



Invest in Freedom
BUY WAR BONDS





Insley Helps **SPEED VICTORY**

Speed is an essential element in today's plans for victory . . . speed on the battlefield . . . speed on the production - for - war front. When you remember that speed has for a quarter of a century been an outstanding feature of Insley excavators, it's easy, then, to understand why all Insley production is now earmarked for our armed forces . . . why Insley excavators are playing a vital role in helping to *speed the day of victory*. **INSLEY MANUFACTURING COMPANY, Indianapolis, Indiana.**

INSLEY

ROADS AND STREETS, June, 1943

H. W. Graupner, general sales manager, formerly southern sales manager. J. L. Quarles, southern sales manager, formerly special representative. G. R. Ostrander, credit manager, formerly assistant credit manager.

Griffin Wellpoint Corp. Opens Southern Branch

The Griffin Wellpoint Corporation, New York, N. Y., has opened a branch office and warehouse at 633 North Myrtle Ave., Jacksonville, Fla. Wm. J. Carr is manager.

Climax Engineering Wins "E" Award

The Army-Navy "E" was awarded to the employees and management of the Climax Engineering Co., Clinton, Ia., on May 7. Presentation of the Award was made by Brigadier General Norman F. Ramsey, Commanding Officer of the Rock Island Arsenal, and accepted on behalf of the company by Edward F. Deacon, president of Climax. Commander A. F. Duernberger, Commanding Officer, Naval Training School, Ames, Iowa, presented the token "E" pins to the employees.

Cleaver-Brooks Awarded Army-Navy "E"

The Cleaver-Brooks Co., Milwaukee, Wis., was awarded the Army-Navy "E" on May 28.

Mack Executive Offices Move to Empire State Building

Press of war work has forced removal of the executive offices of Mack Trucks, Inc., from quarters in the company's Long Island City plant into new offices in the Empire State Building. The move took place on June 1st. The new home offices in the Empire State Building are on the 20th floor and comprise 22,900 square feet of floor space. This marks the return of Mack to New York City after a seven year absence. The move, according to Mack officials, will add thousands of square feet of much needed floor space in the Long Island City plant for the production of war materials, notably fire engines for the Army and Navy. Mack recently expanded its truck and marine engine production lines at Plainfield and New Brunswick, N. J., and at Allentown, Pa., by acquiring factories in and near those cities.

The Pioneer Does It Again



—Full Hydraulic Control—

The Root Model No. 55 Truck Patrol is a machine of many uses. Grading — Ditching — Shoulder Work — Cutting Sod — and Shaving Snow and Ice are but a few of its many valuable uses.

**Working Today for Victory—
Tomorrow for You.**

ROOT SPRING SCRAPER CO.
KALAMAZOO, MICHIGAN
Since 1891



**ALL OUT FOR THE WAR
EFFORT AND VICTORY!
BUT FULLY PREPARED TO
MEET YOUR POST WAR PLANS**

★ In Trojan equipment you will have machines that will make "after victory" contracts more successful. We are looking forward to the post war era when we can again take care of your normal requirements.

Trojan equipment includes GRADE RIPPERS — TAMPING ROLLERS — SHOULDER EXCAVATORS — SCRAPERS — MAINTAINERS — GRADERS — SNOW FLOWS.

**CONTRACTORS MACHINERY
COMPANY, Inc.**

BATAVIA, NEW YORK, U. S. A.

New Equipment and Materials



Athey Mobiloader W4-I

New Athey Mobiloader W4-I

Athey Truss Wheel Co., Chicago, announces an improved model Athey Mobiloader which operates with the "Caterpillar" Diesel D4 Tractor.

Although simplicity in design is the chief change, its manufacturer states, there are numerous improvements over its predecessor model which has been in the field for 4 years. The new model has increased stability, greater operating range, reduced height to

simplify transportation and lower center of gravity. It has a bucket capacity of $1\frac{1}{2}$ cubic yards.

Athey Mobiloaders, made in sizes to fit "Caterpillar" D8 and D4 Tractors, are characterized by their "straight line" loading action. Digging the load at the front, the

outfit travels in reverse to the truck or fill and discharges the material overhead.

New "500" Catalog

Link-Belt Speeder 2 to 3 yard shovels-draglines-cranes are covered by new 24-page catalog No. 1960. Self-aligning rotating rollers, perfect-guiding non-clogging treads, rigid drive end, interchangeable side frames, and, of course, Speed-o-Matic

Hydraulic Power Control—all are illustrated and described, with ratings, specifications and dimensions for each of the seven models. Request from your distributor or from Link-Belt Speeder Corp., 301 W. Pershing Road, Chicago.

New Rubber-Like Hot Poured Sealing Compound

A new rubber-like hot poured joint sealing compound has been developed by Serwind Products Corp., 6061 West 65th St., Chicago, Ill. This compound, known to the trade as Para-Plaster, contains no critical materials, and is claimed to bind firmly with concrete, steel or wood, and perform as a joint or crevice sealer against infiltration of water or any other foreign matter.

New A.C. Welded Line

With a view to expanding its welding equipment service to war industries, Harnischfeger Corporation, Milwaukee, has added a complete line of Industrial A.C. arc welders to its present extensive line of P&H D.C. machines. Engineered and built for industrial service, these machines are being made in 7 Heavy Duty and 4 Intermittent Duty models with a range of capacities for handling pro-

KOTAL

has been shipped to
ELEVEN AIRPORTS
in

Alaska Wisconsin
Yukon Ontario

To aid Asphalt Paving
in wet areas

or

with Hydrophilic Gravel

for Waterproofing

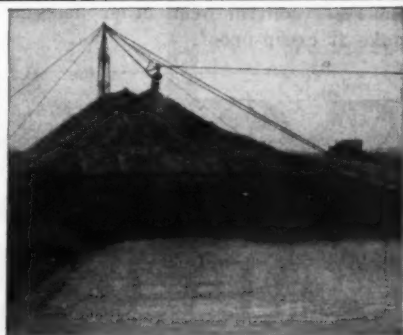
Asphalt Emulsion Mixes



for Details Write

KOTAL COMPANY
52 Vanderbilt Ave., New York

MORE YARDAGE with LESS LABOR



Sauerman Cableway Digs Reservoir

WHERE loose materials must be dug, hauled, and dumped at ranges from 100 to 1500 ft. the economical way to do it is with a Sauerman Scraper or Slackline Cableway. First cost of a Sauerman machine is reasonable, maintenance expense is small, and the simplicity of operation permits one-man control of even the largest installation.

SAUERMAN BROS., INC.

588 S. Clinton St., Chicago

SAUERMAN
LONG RANGE MACHINES

TAKE GOOD CARE OF YOUR



HERCULES ★IRONEROLLERS★

Keep Hydraulic system filled with proper oil, and free of air and dirt. Send for HERCULES Care and Operation, Bulletin H-3713.

THE
HERCULES
COMPANY
MARION-OHIO

Reliance

**CRUSHING, SCREENING
and WASHING UNITS**

● Up to 2000 Tons a Day ●

Crushers	Bins	Drag-Lines
Elevators	Pulverizers	"GAYCO"
Sweepers	Feeders	Centrifugal
Screens	Spreaders	Air Separators
Wash Boxes	Kettles	
	Conveyors	

UNIVERSAL ROAD MACHINERY CO.
Kingslon, N. Y.

Canadian Representatives: F. H. Hopkins & Co., Ltd.
140 Canada Cement Co., Montreal, Que., Can.

NEED A BIG Trailer?

*La Crosse Makes Them
Up To 200 Ton Capacity—*
★ WRITE OR WIRE ★

LA CROSSE TRAILER & EQUIPT. CO.
LA CROSSE, WISCONSIN U. S. A.

BAD GOING? Here's the Truck that eats it up!



If you need a truck for grading, hauling under the worst conditions, snow-removal or similar services you'll find nothing, anywhere, to equal a Marmon-Herrington All-Wheel-Drive converted Ford. Prices are surprisingly low, and operating costs a revelation in dol-

lar-savings. Write for literature.

MARMON-HERRINGTON CO., Inc.
INDIANAPOLIS, INDIANA, U. S. A.

VULCAN PAVEMENT AND CLAY DIGGING TOOLS

ARE MADE in a complete line of sizes to fit all standard compressed air hammers.

Send for NEW Vulcan Illustrated CATALOG today.

VULCAN TOOLS — THE WORLD OVER —
NOTED FOR QUALITY AND DURABILITY"

VULCAN TOOL MFG. CO.
QUINCY, MASS.

ROADS AND STREETS, June, 1943



To speed war production, P&H adds 7 Heavy Duty and 4 Intermittent Duty Industrial Model A.C. arc welders to line, with 20 to 1200 ampere welding service range.

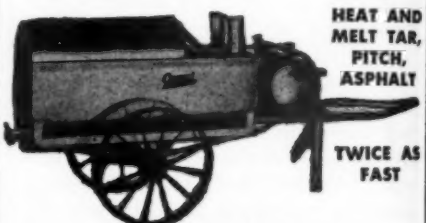
duction welding under continuous operation. The new line features the recently adopted "WSR" (Welding Service Range), ratings which show the actual minimum to maximum output of usable welding current. Specific "WSR" ratings of Heavy Duty models are: 50 to 270 amps., 60 to 375, 90 to 500, 100 to 625, 125 to 750, 150 to 900, and 200 to 1,200—of Intermittent Duty Models: 20 to 185 amps, 20 to 235, 20 to 285, and 20 to 335. Setting and control of current throughout complete welding service range involves one simple, easy-to-operate adjustment. Improvements in the P&H control over other designs make it creep-proof.

Large Capacity Portable Crushing Plant

A portable crushing plant stated to produce 200 tons of aggregate per hour has been brought out by the Iowa Manufacturing Co., Cedar Rapids, Ia. The plant knocked down with five units consists of: primary crushing plant, secondary crushing plant, sizing screen and bin, control pencils, and power unit. The plant can be transported by truck at a speed of 30 to 40 miles per hour. It can be set up and put into operation or knocked down ready to travel in 3 to 4 hours.

Material is handled in a continuous flow from quarried rock to delivery trucks. From the steel flight apron of a heavy-duty rock feeder, rock is

SAVE 50% ON FUEL AND WAITING TIME



HEAT AND
MELT TAR,
PITCH,
ASPHALT

TWICE AS
FAST

AEROIL "HEET-MASTER"

Complete outfits on skids or on steel tires, capacities 80, 110 and 145 gallons. All sizes can be obtained with hand spray attachment. Send for FREE BULLETIN No. 194RS. For full information of concrete curbing machines, tool and surface heaters, asphalt tools and accessories, etc. Write for FREE Catalog No. 240RS.

NEW cleaning and degreasing tanks and sprayers to keep equipment in condition (Bulletin 250RS).

AEROIL BURNER CO., INC.
5711 PARK AVE. WEST NEW YORK, N. J.
Branches: Chicago, San Francisco, Dallas



★ IF YOU USE ★
WHEELS or AXLES
YOU NEED OUR ENGINEERING EXPERIENCE!



WE have cooperated closely with Industry for more than 50 years —producing millions of dependable, efficient steel wheels and axles; each specifically suited to its task. The knowledge gained through all this experience is available to you now—to help you get the utmost service and satisfaction from your "rolling stock." Write today for complete Illustrated Bulletins.



EWC WHEELS
Electric Wheel Co., Dept. RS, Quincy, Ill.

OUTWARD BOUND

TO PUT WAR MATERIALS
WHERE THEY'RE WANTED!



JAHN Trailers are moving right along with the Army putting battle material where it's wanted in a hurry. War time performance can teach much for peace time operation. The advantages that Jahn Trailers bring for getting the war jobs done will help you meet competition after the duration.

Sturdy, heavy frames, proved brake and axle design, easy convertibility from full to semi Trailer, any axle or wheel combination, and other Jahn features assure you certain dependability and adaptability to your equipment moving problem. Plan for the future. Let us send you the new Jahn catalog to help you.

C. R. JAHN COMPANY

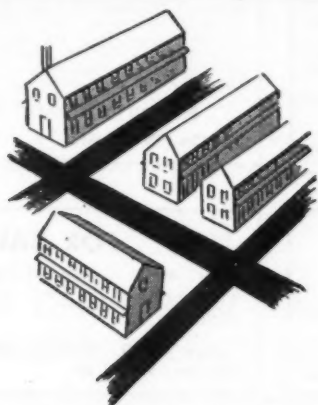
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Chicago

Any Axle
or
Wheel
Combination



"COME
TO TRAILER
HEADQUARTERS"

ASPHALT for CANTONMENT STREETS



Various low-cost types of Asphalt construction are ideally suited for cantonment streets where an improved all-weather surface is needed. Asphalt can be easily maintained for as long as it is needed, and can be abandoned at any time without a great investment loss.

Wherever Standard Oil Asphalt products are sold, there is an Asphalt Representative who can give you full information about these and other uses of Asphalt. Write

STANDARD OIL COMPANY (Indiana)
910 SOUTH MICHIGAN AVENUE, CHICAGO



All Wisconsin Air-Cooled Engines are equipped with an exceptionally rugged, oversize crankshaft (as compared with other engines of comparable size)...drop-forged for maximum molecular compactness and ability to withstand the terrific pounding to which this vital unit is subjected in heavy-duty service.

Because the burden of heavy-duty engine operation falls on the crankshaft, we feel that no crankshaft can be made "too good". We build them as good as we know how.



WISCONSIN MOTOR
Corporation

MILWAUKEE, WISCONSIN, U. S. A.
World's Largest Builders of Heavy-Duty Air-Cooled Engines



FASTER DRIVING! FULL PROTECTION!

With This Improved

**WELDED STEEL
PILE SHOE**

AVAILABLE
for SHIPMENT
ON SHORT
NOTICE

- Saves Time
 - Saves Trouble
 - Proven Money-Savers
- The Morrison Welded Steel Pile Shoe is slipped over sharpened pile and fastened in place by driving nails through holes in four wing points. Wing points may be easily hammered into position (without danger of breakage) to conform to shape of pile.

MORRISON METALWELD PROCESS Inc.

1437 BAILEY AVE. 14 E. JACKSON BLVD.
BUFFALO, N. Y. CHICAGO, ILL.

Clearing House

P&H 600 No. 3053 Shovel, 1 yd., 40' Boom. Good shape, load now, FOB Mo., \$6,000.00.

Thew Lorain 1 1/4 wide Dipper, 32T. Wt. FOB KC: \$4,000.00. Old but good, all gears 90%. Fine for coal or rock.

Byers rebuilt Bearcat Jr., high lift, late model Shovel, air fired factory trailer. FOB KC., \$4,500.00. Ready to go.

We have practically everything you need.

Call Wire Write

KENNEY MCHY. CO.

2136 Jefferson, Kansas City, Mo.

EXCEPTIONAL BARGAINS IMMEDIATE SHIPMENT

FOR SALE:

44C Barber-Greene Ditcher.
10S Koehring Mixer on 2 Pneumatic Tires.

4" Rex Self Priming Pump—Gasoline Power.

FOR RENT:

522 Barber-Greene Pneumatic Tired Bucket Loader—Gasoline Power.

PAUL L. MATCHETTE COMPANY

Exclusive Distributors for Barber-Greene Co.

Missouri — Kansas — Oklahoma
20 West 9th Street, Kansas City, Mo.

TRANSITS and LEVELS

**New or Rebuilt
Sale or Rent**



Headquarters for
REPAIRS — any make.
Factory Service. We will
also buy your old in-
struments or take them in trade.

A complete line of Engineering
Instruments and Equipment for Field
or Office. Write for Bulletin RS 86.

WARREN-KNIGHT CO.

Manufacturers of Sterling Transits and Levels
136 N. 12th St. Philadelphia, Penna.

FOR SALE

1—Barber-Greene heavy duty bituminous travel plant completely rebuilt, very fine condition.

1—Insley Type "R" combination shovel dragline crane, rebuilt.

1—Koehring No. 1 Dragline and Crane, rebuilt.

1—Complete Well Point System.

Anderson Equipment Co.
Merchants Natl Bank Bldg., Omaha, Nebr.

TIRE REPAIRS

In all sizes of tractor, truck, wheelbarrow, passenger, or 1000x24 tires.

An EQUA-FLEX "Sectional" repair constructed in your tire is guaranteed. Best results and prompt service!

We have pre-war quality used passenger, truck and some farm tractor tires.

WALLACE TIRE SERVICE, Inc.

2320 S. Michigan Ave. Chicago, Ill.

Position Wanted as Supt. or Gen. Foreman on large project. 30 years' experience on Highway and City Paving and heavy and light grading, Sewers, Levees and Airports. Now employed but available on short notice. Sober and dependable. References.

Box 1010, ROADS & STREETS,

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Equipment Wanted

20 to 25 Ton Locomotive Crane.
1—600 Ft. Cap. Air Compressor.
1—Barber-Greene Bucket Loader.
1—24 x 36 Jaw Crusher.
1—Switching Locomotive.

RUSSELL STANHOPE

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TRENCHING MACHINES

P & H Model 10-30

Digs 36" wide and 13' deep.

Excellent Condition.

Also, Like New 21 Parsons.

THE CHAS. M. INGERSOLL CO.

19930 Detroit Road Rocky River, Ohio

FOR SALE

Northwest Crane Model 105 or 104 with Shovel or Pull Shovel Attachment.

Box 1000, ROADS AND STREETS,

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Critical Construction Machinery

COMPRESSORS

- 1—New LeRoi Model 315 gas engine driven portable compressor.
- 1—New LeRoi 60, gas engine driven Compressor, on 2 steel wheels.
- 1—New LeRoi 105 gas engine driven Compressor, on 2 steel wheels.
- 1—New LeRoi 210 gas engine driven Compressor, on 4 steel wheels.
- 1—Rebuilt Sullivan 220 cu.ft. gas engine driven Compressor, on 4 steel wheels.
- 2—Rebuilt 160' two stage, air cooled, Chicago Pneumatic Compressor, on rubber tires.
- 1—New 315 Gas Portable.

WELDERS

- 1—Rebuilt 150 amp. Wilson Electric Motor driven Welder.
- 1—Rebuilt Dual-Arc 250 amp. gas engine driven Welder, on 4 steel wheels.

PUMPS

- 4—New Carver 2" 10,000 g.p.h., mounted on two-wheeled trailer.
- 4—New Carver 3" 15,000 g.p.h., mounted on steel wheels, self-priming centrifugal pumps.
- 6—New Carver 40,000 g.p.h., self-priming centrifugal pumps on two-wheeled trailer.
- 1—New Carver 90,000 g.p.h., self-priming centrifugal pumps on two-wheeled trailer.

BUCKETS

- 1—New Williams Model 20-X, 3/4 yd. Dragline Bucket.
- 1—New Williams Model 14-F, 1/2 yd. Clamshell Bucket.

GENERATORS

- 2—Universal 6 KW generating sets, AC, single phase, 60 cycle, manual control.
- 1—Rebuilt 20 KW, 125 volts, Fairbanks-Morse Diesel Generator.
- 2—Rebuilt 15 KW, 110 volts, Allis-Chalmers gas engine driven Generators.

GENERATORS—(Cont.)

- 5—New Universal 5 KVA, 120 volts, gas engine driven Generators.
- 1—New Koehler, 5 KVA, 120 volts, gas engine driven Generator.
- 2—New Koehler 1 1/2 KVA, AC, 1500 watt, gas engine driven, 120 volts, single phase, Lighting Generators.
- 1—New Koehler, 10 KVA, 120 volts, 1 phase, 60 cycle, gas engine driven Generator Set.
- 2—New Lister-Blackstone "Nite-Hawk" Portable 5 KW, 120 volts, AC, Generator Sets, complete with four 1,000 watt reflectors mounted on 8' telescopic extensions mounted on two-wheel spring mounted trailer.
- 1—Rebuilt 50 KVA Superior diesel engine driven Generator, V-belt drive, 220 volts, 3 phase, 60 cycle, AC Generator, .8 power factor, powered with Superior 100 h.p. 6-cylinder diesel engine.
- 1—Rebuilt 18.7 KVA Superior diesel engine driven Generator, direct connected, powered with 2 cylinder engine, 1200 r.p.m. and Columbia Generator, 220 volts, 3 phase, 60 cycle, .8 power factor. Machine in excellent condition.
- 1—Rebuilt Buda 15 KW gas engine driven Generator Set. 110 volts, DC.
- 1—Rebuilt 7 1/2 KW Winton gas engine driven, 110 volt, DC Generator Set.

CRANES AND GRADERS

- 1—Huber No. 4 Motor Grader gas engine driven, 12 ft. blade, including scarifier and cab.
- 1—Browning type "E" 10-ton truck crane, mounted on 6-wheel drive tandem unit, 30 ft. boom, double outriggers.
- 1—Michigan TMCT-16, 1/2 yard Shovel Front, 1940 model.
- 1—P&H 600 Shovel Front and dipper.
- 1—Novo, single drum, 2 nigger head hoist with 70 ft. mast.

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CHICAGO CONSTRUCTION EQUIPMENT CO.

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PHONE
RIVERDALE
1300



Morock Super-Quarry Crushing Plant

carried into the 2540 primary jaw crusher, which will receive any rock that can pass through a two cubic yard shovel dipper. Clutch control provides steady flow of rock into crusher and eliminates possibility of crusher choke-off.

From the primary crusher, material is conveyed to a Cedar Rapids 4" x 12" double deck horizontal vibrating screen. Largest oversize is fed to the secondary 1036 roller-bearing

jaw crusher, and the next oversize to the 4024 roller-bearing roller crusher. Tailings of the secondary crushers are returned to the screen for grading.

From the secondary plant, material moves to the bin unit, where a second 4'x12' screen does final grading. A 40 yard capacity, two-compartment bin temporarily stores and delivers the material to trucks.

The plant is designed so that it can be driven either by electricity, by a combination of diesel and electric power, or by diesel power alone. In order to insure a smooth flow of aggregates through the plant, and to eliminate breakdowns, primary and secondary crusher plants, vibrating screens, and conveyors are independently driven. Entire plant is operated from a central control panel.

"TIME"

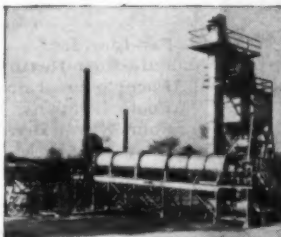
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FLEXIBLE ROAD JOINT MACHINE CO.

WARREN, OHIO, U. S. A.

Asphalt Mixing Plants

STATIONARY and PORTABLE

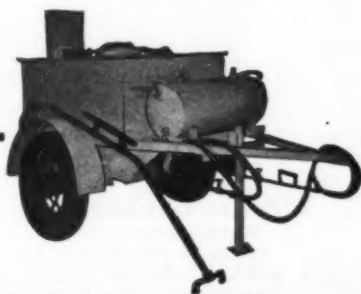


★ Hetherington & Berner asphalt mixing plants, products of the pioneer builder of asphalt machinery in America, incorporate the latest features of design which have been proved in performance. Specifications conform to the most rigid state and city requirements, both as to engineering design and safety regulations. Write for Bulletin RS-260.

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America's First
Builders of Asphalt
Paving Machinery

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Hand and Motor driven spray.
Many sizes. Write for catalog.

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● Watch out for those minor damages that might put your highway mower out of action for the duration. A little extra care prevents extra wear and repair!

If you own a Silver King, you'll see, more than ever, what it means to have a mowing unit ENGINEERED for the job. If you want replacement parts now to insure tip-top "good-as-new" performance tomorrow, write. We will be glad to serve you.

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Manufactured by

The Burch Corporation
CRESTLINE, OHIO

Burch Equipment Since 1875

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FOR TIMBER CONNECTIONS



Specify and Use **HIGH TENSILE STEEL BOLTS**
ADD STRENGTH
INCREASED SAFETY FACTOR
SAVE CRITICAL TIME
LABOR
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Bolts and Pins currently available of high tensile strength steel cut erection time and conserve critical field labor when used as wood connectors. Write for design bulletin.



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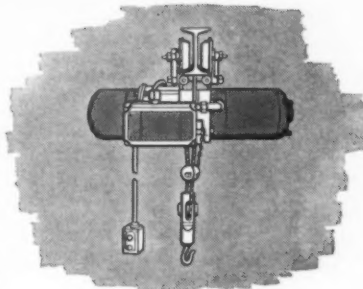
Salient

POINTS IN CMP

Re: *Buying Wire Rope*

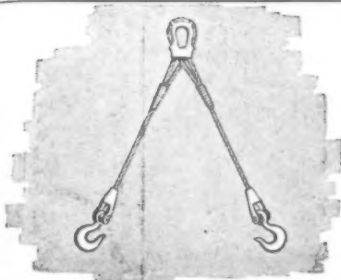
WHEN BUYING WIRE ROPE FOR INCLUSION IN A PRODUCT YOU ARE MAKING,

REMEMBER: Wire rope is a Controlled Material • Your orders should bear the abbreviated allotment numbers—such as: W-8-20 • Preference ratings on orders bearing allotment numbers are valueless. Wire rope producers are required to fill authorized controlled materials orders without regard to preference ratings • The allotment number on a wire rope order must show the actual month of delivery and *not* the quarter in which delivery is required.



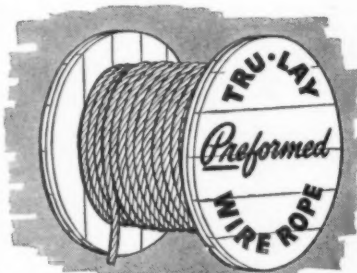
WHEN BUYING WIRE ROPE ASSEMBLIES,

REMEMBER: Assemblies consisting of wire rope and fittings are Class B if they are air-borne, but Class A if they are not • If Class A, you must furnish us with an allotment of the steel required for the wire rope, and for the fittings if they are also class A • If Class B, you must not furnish an allotment of steel for either the fittings or the rope • In either case, your orders must bear allotment numbers or they cannot be considered delivery orders for products containing controlled material.



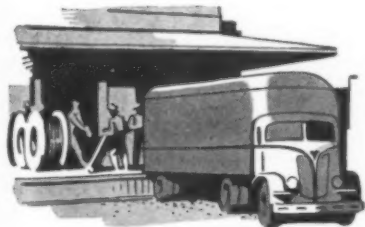
WHEN BUYING WIRE ROPE FOR MAINTENANCE, REPAIRS, OR OPERATING SUPPLIES,

REMEMBER: Subject to the limitations imposed upon you by any "P" order under which you may be required to operate, and provided you produce a product or are engaged in any business in Schedules I or II of CMP Reg. 5, the symbol MRO on a wire rope order, followed by any appropriate certification, makes your order an authorized controlled material order, and • A preference rating is not required, because wire rope is a controlled material • Just be sure to observe the quantity restrictions stated in Par. (f), CMP Reg. 5.



WHEN BUYING WIRE ROPE IN SMALL QUANTITIES FROM WAREHOUSES,

REMEMBER: You don't need an allotment number or a preference rating for wire rope if • 1—You order in amounts of \$10 or less, • or 2—If you don't buy more than 4,000 pounds per calendar quarter, or • 3—If you are authorized to buy it under Food Production Order 3 • Just be certain that you don't exceed the inventory limitations stated in CMP Reg. 2 • Certify your orders as stated in CMP Reg. 4.



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BRIDGEPORT, CONNECTICUT

(May 20, 1943)

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